

AVIATION WEEK

A McGRAW-HILL PUBLICATION

DEC. 6, 1954

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65 MILLION HOURS!

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NEWS DIGEST



Monacaup Tests New Metair Businessplane

Exhibition and certification trials are under way on the new four-place Monacaup Metair businessplane, which is designed for 180 mph cross speed at 7000' power. Two 150hp Lycomings

non-blown fuel-injection prop. The aircraft Metair costs \$27,950, 75% of fuel in single seats. Range with full fuel load is 158 mi. Crossing about 1,000 ft., the plane climbs 1,950' per

Domestic

Trans World Airlines, according to industry sources, is ready to buy 30 or more new Lockheed turboprop Super Constellations (see p. 17). Unit price of the new planes is reported to be about \$1.6 million. A joint announcement from Lockheed, Howard Hughes and Pratt & Whitney was reported in previous issue.

Lockheed's Dart turboprop engine transonic cruise was completed last week. With 10,000 lb. of thrust, it is the first of Civil Aviation Board and Civil Aeronautics Administration by Kenneth Parker, chief testatrix of the engine firm's California branch.

Outstanding helicopter has been test-flown by Goodman Aircraft Corp. at Akron, Ohio. Designated GA-608, it is being demonstrated to the military.

Br. Theodore Van Kerkom has won the 1954 Wright Brothers Memorial Trophy for "outstanding public service in a criticism of enduring value to aviation in the U. S." The award is made by the National Aerospace Assn.

Most flight across the mid-Atlantic, with a stop at the Azores, was made by 24 Republic F-84 Thunderjets of the 50th Strategic Fighter Wing. The 5,063 mi. trip was made in 72 flying hours. Insight modeling was used on the Strategic Air Command leg.

Turboprop Lockheed C-130A Hercules, USAF cargo assault transport, will fly freight at direct cost of 40 cents a mile, with inherent operating costs of half that figure, according to Robert W. McAllister, chief engineer for Lockheed Aircraft Corp., Georgia Division. Design payload is 20,000 lb. at 100,000 lb. gross weight.

Tenex Aircraft Corp., Dallas, has received a multi-million-dollar contract for Lockheed F-104 Starfighter, extending firm's production of these aircraft well into 1956.

MacKay trophy has been awarded to Strategic Air Command's 416th Air Division, Inc. "most meritorious flight of 1953"—mainly missions by 25 Re-

public F-84 Thunderjet fighters, during which 17 planes flew 4,931 mi. from Germany to England and the others flew 5,973 mi. from Germany to Morocco with air refueling.

Rolls-Royce Dart turboprop engine transonic cruise was completed last week. With 10,000 lb. of thrust, it is the first of Civil Aviation Board and Civil Aeronautics Administration by Kenneth Parker, chief testatrix of the engine firm's California branch.

International

Loss of cabin passenger while at 21,000 ft. when a window blew out was experienced by British Cimex Airways Corp. Flying Swissair from state is England from New York Nov. 29. Crew safely took plane to lower altitude.

Propeller was lost or ruined by British European Airways' Aeroplane Andover while leaving London for Amsterdam Nov. 28. Pilot made safe landing. Nine of 15 passengers or crew of six were injured.

William R. Turnbull, 54, Canadian pioneer in the development of controllable pitch aircraft propellers, died Nov. 26 at St. John, N. B.

USSR Academy of Sciences has established the Tsiolkovsky Gold Medal to be awarded to Soviet citizens for outstanding work in interplanetary communications, the Soviet newspaper, Pravda, reports. The medal started after K. Yu. Tsiolkovsky, founder of interplanetary, according to the Russians.

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- 11 SWERVING
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The Aviation Week
December 6, 1954

Headline News

Bigger Air Forces Smaller Navy*
Airlift Needs Smaller Air Weapons
AF to Buy 1000 F-100s
Bomber Dept. Interests Still Controversial
Superior Flying Tops \$1.5 Billion
Berkman Backs on Naval Computer
U.S. Navy Lays Out New Plan
Mitsubishi Gets Cope's Airlines
Lockheed Delays Supersonic Lancer
British to Build Strategic Comet 3
Airlifts to Europe, 2000
Pentagon Clash Aids Bigger Projects
Civil Aircraft Signups Increase
Tool Leasing Success Under Fire
Aviation Week's 100 Best Metalworking
Firms Name Their Late Gains

Aeronautical Engineering

F-100 Undergoes 5000 Hours
Tie Match Optima & Hydrolite
Powered Gear Is Test Target

Production

All-Metal Biplanes Built Best

Arbitrators

Experts Tackle Traffic Control...
New Equipment For Service Stations

Equipment

Underwater Sensors of 200 Recorded

Air Transport

Anthony and Shirey Gains in '54
Reynolds May Dept. Lines Control
A-3 GAL-3 Set Marks on Biplane
FAL Lines Shared in N. Y. Harbor
Panhandle Airlines in Marketing
Airports Need 100 Millions

Editorials

A Separation Equipment
The Public Way Wins
The Von Kármán Award

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Cessna Aircraft, Inc., (Continued) 1954
Boeing Airplane Co., Inc., (Continued)
Airline Inc., 49-51, 53, 55, 57, 59
B-57—1954 Defense Electronics
Futura Airlines Co.

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AVRO-CANADA CF-105 MARK 4s, underlining military of RCAF's long-range all-weather fighter-air defense, are soon minus their wing tip rocket pods. Planes also have eight-gage belly tanks. Company has revised development contract for a new fighter, the CF-106.

Twin-Jet Fighter Styles Here and in Canada



PARADEKAGE OF F-101, new McDonnell F-101A Voodoo leads a Lockheed F-104A (top) after a flight test. Powered by two Pratt & Whitney J75 F13 turbojets, F-101A is in production for Strategic Air Command. Planes are now given "wing tail" set high on fin.

AFTERSHOCKERS SHOOT FLAME as Convair F-102A Delta fighter makes short catapult takeoff from USS Hancock. Missiles weapon is visible on tail fin. Convair. New flame catapult is especially designed to simulate takeoffs of Navy's latest interceptors.



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WHO'S WHERE

In the Front Office

Adm. J. L. (Buck) Clark (USN Ret.), executive Assistant Chief of Naval Operations for Air (USN-40) and commander of the Seventh Fleet during the Korean War, has become a vice president of Remington Rand, Inc., New York.

Robert C. Clegg, former director of laboratories for Radio Aircraft Corp., a now defunct division of Electromechanics, Inc., San Diego.

Norman Shatto has been promoted by Fan American World Airways to vice president, Airline Relations. He is a new FAA senior vice president.

George A. Page, Jr., has moved up in American Manufacturing Corp., Middlebury, Conn., from engineering director to vice president research and engineering.

H. William Clegg has been elected a vice president of American Machine & Foundry Co., New York, will coordinate all defense and industrial sales.

W. Tom Neal has been appointed a vice president and director of Aero Corp., Atlanta, Ga.

Changes

G. Bert Miller, executive president and chief executive officer of Pacifica Holdings Corp. and former editor of Pacifica Analysts Co., Glenn E. Morris, Co. and Republic Analysts Co., joined Northwest Analysts, Inc., as executive director to the president, John W. Moers.

Kenneth L. Clark is general manager of General Gear Corp.'s new subsidiary, Federal Metal Products, Los Angeles.

Robert C. Clegg, formerly executive promoted to general manager of Minnesota Electrician Corp., St. Paul, subsidiary of Electromechanics, Inc.

Charles Becker has been appointed managing director of General Electric Co.'s Eastern Sales Division, New York.

Robert G. Black has become manager for the New York office of Massachusetts Housay, with headquarters in Des Moines, Minnesota.

J. E. Miller has been named vice president of Telephone & Telegraph Co., Dallas, Tex., to manage all of the specific equipment products.

Honors and Elections

By John H. Freder, Then Winkl, Associate Director of Air World Education, will receive the Frank G. Bowen Trophy Dec. 17 at the annual Wright Brothers Memorial Dinner in Washington, D. C.

George Horowitz, York (Pa.) Airport, is now president of the National Airports Trade Association. Other officers: Tom Ferguson, Allentown (Pa.) Air Service, executive vice president; Ken Cross, Cross Aviation, Inc., Houston (Tex.); Maurice August, western vice president; J. David Flager, Flager, Inc., New York, N. Y.

Frank E. Moshier, director vice president traffic and military liaison director for Air Transport Assoc., is now executive secretary of *All Am Air Traffic Conference* of Ameri-

INDUSTRY OBSERVER

► Two new trends in turbogear engine development are the use of rotating stators to produce a compressing effect on the compressor and the use of heavier layer coating. Both developments are being applied to new high-speed engines by manufacturers on both sides of the ocean.

► Navy will continue its development of vertical takeoff and landing aircraft with the use of turboprop and rocket power under the turboprop being used in the Convair and Lockheed VTOL. Use of the jet that also is being studied as a means of controlling altitude of the aircraft.

► Latest reports indicate that Russia has developed an operationally reliable ballistic missile with a range approximately twice that of the German V-2. The German missile had a range of about 150 mi. Test ballistic missiles now reaching production stage in the United States is the Army's Redstone, with a range of less than 200 mi. The Soviet also is working on other ballistic missiles with a maximum range up to 1,500 mi.

► Factors of Pentagon planners to stick to a set course in use of the many reasons for slowdown of missile development. "Stability of requirement" is a top concern; "my biggest headache." We must get under way on a project when down some orders changing the entire concept and we have to start all over."

► Westland Aircraft, Ltd., of England will build the two-engine Sabrely S-56 at its Yeovil plant under license from the American manufacturer. Westland's S-56 will be called the Wernera and offered for both military and commercial use.

► Allison Division of General Motors Corp. has delivered more than 15,000 203-hp centrifugal jet engines to Air Force and Navy since 1945.

► Douglas Aircraft Co. is modifying a C-133 Globemaster to take an experimental Pratt & Whitney 257 turboprop. The engine is expected to be in the 15,000-epoch class and it is intended to power the Douglas C-133A logistics aircraft around a 150,000-lb. payload.

► Rolls-Royce, Ltd., is developing a supercharged turboprop to meet the specification from Bristol's B-25 turboprop (Aviation Week Oct. 25, p. 21). Rolls' entry will be named at a thrust rating of about 4,500 shp. that may be maintained at an altitude of about 20,000 ft.

► Nipper Division of English Electric is casting a bid for the engine turboprop project, offering a 10,000 shp. plant for Concorde 140 and Avro Arrow derivatives. Nipper has bought a Concorde 340 for installation of two Elsack and plans to push the conversion engine project and the operation of Concorde 340s after an appropriate certificate is obtained. Nipper also plans to install two Elsack in an Avro Arrow, only one yet and hope to interest British European Airways, now operating piston-powered version, in the conversion. Nipper also is developing a 6,000 shp. version of the Elsack turboprop.

► Port of New York Authority is thinking in terms of four-engine turboprop at planning midtown heliports. Only midtown heliports will be used and four-engine availability is available.

► Sale Flight Instrument Corp.'s still indicates it being installed in the Fairchild C-123.

► Army new estimates it has more than 12,000 jobs authorized for electronic maintenance specialists.

► Heavy cranes Boston and Cushing will be put into operation during 1955 by the Navy at the first combatant guided missile ship of their type.

Three New Developments Raise Basic Airpower Questions:

Bigger AF, Smaller Navy, New Tactics?

1. Field Marshal Montgomery wants to get rid of carriers.
2. New TAC concept portends upheaval in military missions.
3. Talbott asks jump to \$15-16 billion in USAF's '56 budget.

By Claude Wilson

Bigger air forces and smaller navies with no carriers are demanded as a new strategic concept presented to the United States by Field Marshal the Viscount Montgomery of Alamein, Deputy Supreme Commander, Allied Forces in Europe.

In agreement with President Eisenhower and Pentagon planners, Montgomery says he could create a stronger continental air force in military cooperation, giving full emphasis to the need for dominance in the air.

The British field marshal's plan is certain to run into stiff opposition from the U.S. Navy.

► **Budget Walks**—Although Air Force Secretary Harold E. Talbott said he will ask an increase of about \$4 billion over the next 1955 and 1956 budgets (see p. 12), the Navy has remained silent on its position.

All branches of the armed forces naturally are at the final stages of planning fiscal 1956 budget proposals.

Defense Secretary Charles E. Wilson, commenting on Montgomery's strategic demand that no more money be spent on aircraft carriers, and funds for a fifth Fleet-class carrier probably will be included in the fiscal 1956 defense budget.

► **Air War Concept**—Montgomery's views were given privately to the White House; the to the public is an address at the California Institute of Technology. It was evident that the British military leaders, largely a post-war team, understand the leadership in a drive to build Allied fighting forces to the concept of what atomic and thermal nuclear war will be like.

Major points in his program:

- There is no doubt that it was correct atomic and thermal nuclear weapons will be used.
- Western powers will lose any future war unless they recognize that air can stand and control, eliminating the emphasis on airpower as a support for ground forces. "The present organiza-

tion," Montgomery says, "is unworthy of a group of nations who claim to have some knowledge of war."

Under current conditions, it is natural that navies have their own air forces. However, this situation will change rapidly and land-based airpower soon will control the sea. For this reason, there is a strong step building any more naval air units.

► **We're a first-class army in being**, with the exception of strategic and tactical bombers. We must be able to move divisions by air. The conversion is an important military project in that regard.

► **Non-Fleet**—The U.S. Navy's determination to plan on carrier striking forces for many years in the future was made clear by the Assistant Secretary for Naval Air, James H. Smith, Jr. (Aviation Week Nov. 22, p. 30).

Smith argued that a non-fleet air force, sufficiently gathered, can sustain a difficult target on an enemy.

Montgomery, on the other hand, is proposing to President Eisenhower and the Joint Chiefs of Staff a conviction that the Navy's role will not call for any-

thing but small search and destroy forces. British Air Force—As for the Army, the British field marshal says the Air Force should be prepared to recall the foot soldiers with great mobility, taking them away from their dependence on roads.

There is no doubt that Montgomery's viewpoint on these subjects is sincerely held. In U.S. Army leaders, Gen. Creighton W. Abrams, Army Chief of Staff, and Maj. Gen. James N. Corra, his successor for operations, have had their own views on this subject.

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All new armaments, in which the Army will seek a pattern of air field defenses, will be based on the same assumption Montgomery makes. The user will be atomic.

► **Three Air Stages**—The bulk of Montgomery's argument is based on the planned expansion of airpower. He believes that coming air conflicts will be fought in three stages.

► **The first**—The first stage of the war comes in the near future. Piloted aircraft will be used and the force must be so enormous when the war starts—considered by a central authority at the highest level.

► **The second**, not for every, will come when enemy powers have sufficient atomic weapons and planes to deliver them in such the War's offensive power. To meet this threat, we must have both an adequate warning system and good air defense.

► **The third** will arrive with perfection of the hydrogen balloon missile. He believes piloted aircraft will still be used in the initial field but the emphasis will be both space and nuclear war-

Wilson's Answer

Defense Secretary Charles E. Wilson, commenting on the United States will not stop building aircraft carriers, despite advice given by Field Marshal Montgomery.

The field marshal, on Wilson's reply, is a "very brave man" to come to this country and suggest that our Navy prepare to abandon its air arm. He added that neither he nor Adm. Arthur W. Radford, Chairman of the Joint Chiefs of Staff, would do this.

► **British**—Wilson believes Montgomery's views are correct. He says: "The British are right in their efforts to influence U.S. military policy. The Secretary rejoiced to see that

Russia's war-making ability is now emphasized.

have to be put into cropping the enemy's weapons."

► **Air Reorganization**—The British military leader also signs a recommendation of the air committee. His suggestion that air has been destroyed by the splitting of control over aircraft into "compartments."

"It is vital," he says, "that this entire be tackled at once on the highest political level."

Montgomery's second major point about airpower is that the necessary decision to build a large air force has been made. He makes no mention of air mobilization and mobility includes no program for the air and has increased its output of weapons. The timetable, he claims, will allow us to do this because the West must "immediately" re-orient the ability to bomb an adversary offensive as an "air war" against anyone who attacks us."

► **Poly Division**—Montgomery wants that first officer power will be vested "unless it is unusual to defensive power" and can be removed from a major

New Tactical Air Concepts

Allies Need Simpler Air Weapons

Invention of "stealth forces" by the Technical Air Command (AVIATION Week Nov. 22, p. 14) follows sharp changes in the application of American military power. Not only is the structure of TAC combat units revised but the system of combat U.S. services and the equipment policies for America's allies.

USAF officers who fought in Korea and combined their knowledge and skills to create TAC's new-but still rough—look believe their forces began to find the answer to the problem of how to fight an air war with a minimum of collateral damage. Not only is the structure of TAC combat units revised but the system of combat U.S. services and the equipment policies for America's allies.

► **Air Support**—Secretary of Defense Robert S. McNamara has proposed that the Air Force should be given more authority to buy aircraft and weapons systems and to develop its own production and delivery programs.

► **Non-American Powers**—They expect their concepts will undergo some modification as other services come in to buy out over and after TAC's own revision next year.

► **Home**—One outline of what the Big Three's forces will look like and how these would cause Command and Control agencies shaped up this way.

The first lesson of any aggression will be how to be local areas, armed with the types of weapons they can use best. For the West European allies, few should possess complex weapons. The Van Fleet (Gen. James A. Van Fleet) study, conducted during the summer, revealed that forces must widely dispersed over strips. The Germans would have a great deal of trouble wiping out the force.

And the Mighty Midget could pro-

duce 24 planes not now in training at USAF flight schools in the U.S. These planes may give the Korean government some expense but provide little in the way of defense and probably would be destroyed within hours if the Communists should renew the attack in Korea.

► **U.S. Ground Forces**—Conceivably American GI's may fight again as they fought in Korea, the South Pacific and Korea.

But such a commitment would delay the technical development of most forces in the interests of this temporary need, that is, the modernization of the U.S. Army to meet world, logical needs. To this service would fall重任 of base defense, security of industrial concentrations, bases, bombing capabilities at home—each at the strategic or biategic bombing of American cities if a war should boil over at local, state and national.

The last would be of great value, second to the TAC striking forces. American ground forces would be most needed in fighting civil wars and only after a local aggression started and then only as maximum forces or as base defense forces.

► **Indo-China Lesson**—To anyone who merely expected the return of Indo-China, it was also understandable that U.S. industry could have been contented successfully there to fight a front-line war only as they fought in Korea. A long Vietnamese winter would have been required.

This force, organized in a TAC striking force of about 100,000 light bombers and fighters, would be able to defend the area, just as the Allies should be armed with close-support weapons. Such a force, a combat-modified F-86, for example, would be effective in the Philippines.

Another case cited is Turkey. In an future war is equipped with Republic F-84s which the Turks keep 25% operational. Should war come with Russia, the Turks probably would have that 25% in the first day or two of battle because the F-84 is as much an attack aircraft as the Russian MiG-15.

► **China**—Such a force would be better for the Turks to have a much larger number of something like the Mighty Midget. Major (Aviation Week Nov. 22, p. 42), a simple close-support design that operates from small widely dispersed air strips. The Russians would have a great deal of trouble wiping out the force.

And the Mighty Midget could pro-

duce 24 planes not now in training at

the Korean government some expense but provide little in the way of defense and probably would be destroyed within hours if the Communists should renew the attack in Korea.

The Navy and Marines would con-

tinue the development of missiles and amphibious assault to provide additional necessary forces. Navy airpower should work out methods for

months to complete, make no sense to me.

Comments: As Dr. R. C. Neudecker, Bell Telephone Laboratories, Dr. H. R. Shuford, president of Airborne Instrumentation Laboratory, and Prof. J. B. Wurster, director of the Research Laboratory for Electronics, Massachusetts Institute of Technology.

Big Win: Milton W. Arnold, Air Transport Ass't, a division of ANAC's advocacy committee.

Tax Test Case

- U. S. hits Los Angeles tax on Convair, Arrowjet.
- Says government work in process is tax-exempt.

In legal proceedings of major importance to the Department of Defense, Los Angeles County will be sued for recovery of taxes of some \$200,000 in taxes paid by the Convair Division of General Dynamics Corp., Pomona, and Antec General Corp., Alhambra.

Wilber M. Brashears, Defense Department general counsel, says the government would challenge the County's right to tax the aircraft division of Convair, a wholly-owned subsidiary of Convair, a south, in a final effort to settle the California situation. Brashears looks upon the West Coast case as a proving ground where the government may settle the question of a municipal's right to tax government property.

The California case will be based on taxes paid by Convair and Antec in 1955 in periodic property assessments on goods in process of manufacture.

► **U. S. vs. Personal Property:** Get off the doghouse is that Los Angeles County cannot any longer tax just for the value of the aircraft in the process of manufacture and subject to tax as the conceptual property.

The manufacturers and the Defense Department hold, on the other hand, that the United States has title to the property under terms of the contract and any tax makes a local personal property assessment illegal.

Actually, the county levied the tax in 1953 and 1954 against only part of the goods in process at about 75 aircraft plants. From the beginning of 1955, the Defense Department made property payments on the aircraft or components. The county held it as taxable to levy a tax on the property not fully paid for.

► **Douglas Victory:** This is not the first time the tax conference has let the county. Two years ago, Douglas Aircraft Co. was involved in a suit with Los Angeles County over taxes paid on un-

soft-hang built for the government. In that case, the county assessed the company for full value of the property, ignoring both the government-held title and property payments already made.

The fight was taken to the California Court of Appeals, and Douglas won.

The attorneys have been made up against the county, and Brashears' office estimates that the 75 aircraft concern taxed in 1953 and 1954 amounted to a total of about \$15 million.

There are no reliable estimates of what the total bill would be if the assessments were held legal and applied to all defense industries in all facilities.

► **Allowable Costs:** This is a clear cut. If the assessment becomes a general practice, the Defense Department should be forced to take the bills into consideration in preparing military budgets because expenses of the type are allowable costs in U. S. contracts.

This case will be brought to the Defense Department. A long line of decisions says the U. S. government is not subject to tax by municipalities.

The Defense Department's general counsel points out that contracts with defense industries are deliberately drawn to give the government total control, and the right to require support, if it is required without cost.

Douglas pointed out that both the Army and Navy have legitimate return expenses related to their needs. Air Force on the other hand has been operating with an inferior system, he said.

"Now it is not just in the aircraft industry, but in other industries as well, that the aircraft is not related to the needs of defense industries or air forces."

He said it is true that freight aircraft

are designed specifically to carry cargo in modern conditions and to use modern ground handling systems.

► **Douglas Support:** Supporting Doyle's stand was another member of the panel, Donald Douglas Jr., vice president of Douglas Aircraft Co. With a well-integrated, modern and efficient system of global air logistics, Douglas and its associates have world-wide vertical assignments, a program of surface transportation and it will not be needed to the extent it is today. The time element would be prohibitive and "costs would be considerably reduced in the long run."

'Must' for Air Forces Its Own Cargo Airline

Aviation firms will need their own cargo airline for adequate logistical support.

This was the view expressed by Brig. Gen. John P. Davis, USAF director of transportation, at the annual meeting of the American Society of Mechanical Engineers in New York last week.

In a special panel discussion devoted to air cargo and air logistics, Davis stressed that a global fleet of cargo planes to transport supplies, troops and equipment will not be ready when it is needed.

► **PSAC Problem:** Referring to the worldwide activities of the Strategic Air Command, he said: "To a degree, the defense establishment of SAC is not independent of procurement. It is not less dependent on procurement than the rest of the military," he said.

The other side of the argument is that the Defense Department is not subject to tax by municipalities.

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Plush Super Connie

President Eisenhower's new Lockheed Super Constellation, the Cabinet plane, is probably the most elaborate executive aircraft ever built.

The super-modern airplane is equipped with a conference table, chairs, two-way radio telephone and electric typewriter, 48 for use when the plane serves as the President's office.

The room can be converted to sleeping quarters by turning the two couches into three quarter-size beds.

The Columbia 3 is powered by four Wright Turbo Compounds

Business Flying

An aircraft used exclusively for business travel operates an average of about 100 hours a year and flies only 40,000 miles. About 100 aircraft have this profile.

► **ATA:** About 32,000 planes are used for business trips by executives. Aircraft range in size from a single-engine plane with a seating capacity of two passengers to transports seating more than 20.

Thermal design is provided in wing and empennage leading edges. Thermal bleed air from the engines provides high temperature and high pressure air for heat rejection.

► **Swedes:** Lockheed is offering the new turboprop transport in several seating configurations: 90 seats plus four in lounge for international first-class; 66 seats, plus four in lounge for domestic first-class; 81 for international coach; and 49 for domestic coach.

Lockheed Offers Turboprop Liner

L-1449 called fastest, longest range, most economical prop-driven transport; cruising speed exceeds 420 mph.

Industry sources reported last week that Lockheed Aircraft Corp. has, armed with blueprints describing a new turboprop version of the Super Constellation, started a worldwide sales campaign of capture the both the domestic and international long-distance airline markets.

The Model L-1449, which features a new four-bladed wing and will be powered by four Pratt & Whitney R-2800s, has passed PT-12 turboprops with more than 6,000 cph each, is being housed by Lockheed as the world's fastest, longest range and most economical propeller-driven transport.

The new turboprop transport version with a cruising speed in excess of 420 mph, is aimed at beating all commercial aircraft on both domestic and international routes—especially with regard to the Douglas DC-8.

► **Polar Flights:** To make its sales pitch to the airline industry, a spokesman for Lockheed has come down to the Arctic and the Middle East, to the Antarctic, Japan and Korea, to the South American and South American markets, as well as around the U. S. and Canada.

Lockheed's spokesman is offering delivery of the new planes for service delivery during the 1957 summer season.

In almost everything but appearance, the turboprop Lockheed is a new air plane. Its nose wheel has 27 ft. main gear, 156 in. G. nose gear and 157 ft. 7 in. lower main gear to clear road from the ground. The Cessna 210 is 14 ft. 10 in. long.

Maximum takeoff weight is estimated at 177,000 lbs., landing weight 115,000 lbs.

Fuel capacity is 10,200 gal. All figures are based on use of #94 fuel.

Cabin pressurization will provide 8,000 ft. cabin at 30,000 ft., and the engines will be heated and pressurized to enable raising of animals.

British Will Build Stronger Comet 2, 3

London: The British government has voted up its share of equity into the Comet 1, which at Elba and Naples, will be Lockheed Aircraft Co. partner.



Swedes Boost Fighter Power

Improved features of the new Saab J-37 Viggen include an airframe as the Swedish Saab DGI Ghost fighter and modification of outer wing struts to meet the plane's initial Mach needs. The Swedish Air Force has ordered 600 and 300-seat variants.

ing new points aimed at putting the Convair 2 and 3 with the air committee.

Sir Harry Shattock, speaking for de Havilland, who previously had been a member of the committee, did not want to blame for the crashes (Aviation Week Nov. 25, p. 15), concluded his testimony outlining several problems.

► **Boeing's solutions:**

- Passage to be strengthened, windows and seats to be refrigerated (probable result) to lower maximum stress concentrations. Strengthening of the turbo-gearbox housing's fuselage fairing under floor slab.
- Hand manufacturing cracks.
- Reliability diagnostic parts to be thickened, certain parts of the undercarriage and main landing gear fairing to be strengthened.

► **Lockheed's solutions:**

- Domestic embourbed, Los Angeles to New York, 5 hr., 50 min., with average service intervals.
- Domestic, nonstop, New York to Los Angeles, 7 hr., 30 min., with average service intervals.

► **Polar Flights:** To make its sales pitch to the airline industry, a spokesman for Lockheed has come down to the Arctic and the Middle East, to the Antarctic, Japan and Korea, to the South American and South American markets, as well as around the U. S. and Canada.

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Civil Aircraft Shipments Increase

Aircraft shipments during September reached 803,800 lbs., increased by volume weight, an increase of 31.5% over August, Department of Commerce reports.

Unfilled orders for civil aircraft with airframe weights of 8,000 lbs. and more were 254, a 21% increase over the previous month's backlog.

	September 1954	August 1954	September 1953
Completed aircraft	265	264	319
By weight of airframe			
Less than 3,000 lbs.	234	248	191
3,000 lbs. and more	31	36	26
By number of places			
1 to 5 places	232	237	303
More than 5 places	33	27	26
By type, hp., all engine			
Up to 100 hp.	201	231	333
100 hp. and more	37	36	26
Total value of completed parts (100 aircraft)	\$14,742	\$15,217	\$18,237
Aircraft parts			
Less than 3,000 lbs.	28,179	15,797	22,067
3,000 lbs. and more	4,988	5,189	2,957
Airframe parts	25,556	15,110	18,118
Total of aircraft completed parts (100 aircraft)	\$3,512	\$3,605	\$3,673
Aircraft engines			
Airframe parts	3,132	4,008	7,222
Engines parts	6,159	6,035	7,559

Lab to Study Gunfire Effect at 60,000 Ft.

The effects of high-explosive shells on aircraft at high altitudes and high speeds will be studied in a new dynamic test cell to be constructed at the Arnold Engineering Development Center, Tullahoma, Tenn.

An Research and Development Command has awarded a contract for the design of the new cell to the New York firm of Cope, Cushing & Associates. Contract plans call for the new test cell to provide simulated pressures for humidity and high explosive static loadings to a selected altitude rate

typical waging altitude of an aircraft. Gunfire or jet fuel will be stored just outside the cell to simulate actual installation.

Complete instrumentation, including balances and motion picture cameras, will photograph the behavior during impact and of the resulting fire. Tests will be made up to simulated altitudes of 60,000 ft. and with a temperature range extending between -50°F and +250°F.

The control of the test facility will be handled by the crew in the adjacent Engine Test Facility, working via the fire control room. Armor plate and insulation will surround the new cell to confine the blast.



Fully Loaded Mystery Dives Past Mach 1

An Indian air force pilot recently dove the French Dassault Mystery 4A past Mach 1. The swooping jet fighter came across the

jet's velocity unfreezing banks and tire tracks of asphalt. It was the pilot's first flight in the Hispano-Suiza Typ powered 4A.

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Tool Leasing System Under Fire

Congress committee urges all services to set price standards on machines used in defense production.

Standard leasing rates for government-owned machine tools used by defense production contractors is urged by the Joint Congressional Committee on Defense Production.

The committee's review of procedures involved in furnishing machine tools reveals there is no standard policy followed by Air Force, Navy and Army.

► **Lack of Standards**—It's primarily the responsibility of the individual contracting officer in the three services to determine what tools, if any, should be furnished to contractors on what

"When prime contractors have required tools, it has been the general practice to exclude the tools under a separate facilities contract. Under that procedure there has been no authority provided for determining the value of the tools to be furnished and, therefore, no consistent policy in effecting a reduction to the production price."

Other details found by the committee include:

- Contracting officers frequently are not informed of the acquisition cost, age or

condition of tools in question and do not have a factual basis for making a proper price adjustment.

► **Negotiations** frequently are based on the contractor's estimated value of the tools required and not on actual tools furnished.

► **Cost Advantage**—Indications are that contractors using government tools may enjoy distinct advantages because over the contractor leasing capital investment in his own tools, the contractor may.

"This is particularly true where a contractor has more than one contract utilizing the same tools. Contractors supplying similar items may find that one enjoys a better profit position as a result of negotiating a better deal on the tools concerned."

"Moreover, the actual government cost of the product to the government is hidden in the tool-adjusted price contract, and there is no way to make a direct comparison as to which contractor is giving the government the best deal."

► **Lease Charges**—The government-owned tools usually are leased by the

armed services on a monthly rental basis. The rate generally is based on 15% per month (48 basis points) of the original acquisition cost regardless of age or condition of the tools.

Defense Department faces the problem of determining a fair rental rate for the general decline in usage, the committee says, so that government tools should be brought into use with commercial users. However, the point is made in other writing that since the government is not in the business of leasing tools so much and since the only reason the government furnished any tools is to aid in defense production in an emergency, industry should not object to the 15% when defense work is involved."

The committee reports the armed services have approximately 460,000 tools and related equipment in use or on hand, including those furnished to civilian and private defense plants. There are an additional 31,000 idle military tools in the defense industrial equipment inventories.

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Los Angeles—The experiment in transporting regular first-class mail by air on a space-available basis started

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In addition, there are grits of all mating surfaces and an assembly sleeve is available to accommodate an entire range of cable sizes. A folder describing this new waterproof plug and the various sizes in which it is manufactured—may be obtained by writing our Sales Department.

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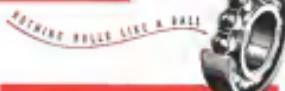
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BALL BEARINGS

Westinghouse J40 jet engine with turbine mounted afterburner. Control for the afterburner is made by 127 New Departure Instrumented belt bearings, insuring extreme precision and efficiency.

so the West Coast Nov. 22, India 17 principal cities in California, Oregon and Washington.

The new service is expected to speed delivery of mail from 24 to 48 hours to these cities.

Acting Los Angeles Postmaster Otto K. Olson predicts the West Coast section will handle about 3 million letters daily.

► **Offices Involved.** Cities directly benefitting by the Scott shift include San Diego, Los Angeles, Bakersfield, Visalia, Fresno, Merced, Stockton, Sacramento, San Francisco and Oakland in California; Boise, Boise Falls, Meridian, Eugene, Salem and Portland in Oregon; and Seattle in Washington.

Additionally, thousands of smaller cities near these points will benefit by this mail service; the Post Office Department says.

The West Coast operation follows similar experiments in 1957 at two newly established strongholds: Chicago, Washington, New York and their major Florida cities and, by local service districts, to communities in 25 states.

► **Ready.** **Willing.**—Regular flight or mail service that guarantees air transportation on scheduled flights will be no new service for the new Scott air mail system, Postmaster Olson says.

Torrell C. Drysdale, president of Western Air Lines, reports his company is "ready, willing and able" to handle the new postal service.

"At the West's major truck ports, Western considers the rapid transportation of mail vital to the continued development of the fast-growing, more progressive region in the nation . . .," he says.

Southwest Prepared To Expand Navajo

Southwest Airlines is prepared to spend \$100,000 to purchase and install mobile radio radio sets at all points on its Route 26, if it receives a permission to relocate its airway over new pending highway the Civil Aeronautics Board, according to vice president Max King.

The program will include installation of infrared VOR, range, glide path transmitters, distance measuring transponders and responder VHF stations and high intensity lights, he says.

"The degree of coordination necessary to acquire full public confidence in schedule reliability can be attained by the combination of modern aids and by improvement of marginal airports to accommodate landing speeds at the lowest safe flying and visibility conditions. The weather minimums must not be so severe to those found at major airports," King adds.

He emphasizes that "at this stage of the development of local service, the

initial problem is secondary to that created by the lack of navigation and landing aids."

"In our interpretation, the effect of unreliability is immediately apparent unless there is a radio connection to local operations, meaning being the least advantage local service enjoys over surface competition."

A passenger who makes an important engagement 100 mi away in much case may change to the bus, but is prone to fly on the next trip than the transcontinental passenger who would prefer drive rather than have to go by airbus.

"We have estimated," he says, "that between \$60,000 and \$115,000 per

year additional income could be generated on Route 26 from improved reliability and regularity to be obtained from the combination of modern systems and landing aids."

Spanish-Built Jet

(McGraw-Hill World News)

Model-A prototype of an advanced jet trainer is under construction at Hispano Aviación, Seville.

The new jet, the first, has two engines mounted in the wings. A single-seat fighter version is on the drawing boards.



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Noise Intensity Hits F-100 Line Crews

George Air Force Base, Calif.—A study of the effects of jet engine noise on maintenance crews here has begun following complaints at this base that crews working on the F-100 are suffering from nausea and pain in the ears.

Symptoms being now are troubling North American Aviation's first operational F-100s.

Effects of the high sound level are both physiological and psychological. Capt. Vernon Parfitt, USAF medical officer, says:

Many of the complaints concern the writer used with the F-100, which develops a level of 157 decibels.

• **Complaints.** The F-100 and its Pratt & Whitney J57 engine produce 160 decibels at the tailpipe and 125 decibels at 1,000 ft., Dr. Parfitt reports.

Any sound of sufficiently high intensity can cause damage to the ear and also internally, he says.

He lists three physiological effects of sound:

• **Heat.** Sound can increase the temperature of the body. Ultrasonic sound, for example, can raise the temperature from 93 F. to 100 F. in one minute.

"The F-100, however, does not produce ultrasonic sounds of any high intensity," Dr. Parfitt says.

• **Swelling** in the kidneys, tendons, joints or teeth.

• **Pressure** reception in the skin can cause effects at 150 decibels, and the skin can feel the pressure.

• **Headache** and presumably what's in it" — headache — can occur at 140 decibels. Vibration also can be felt in the abdominal muscles.

He lists three psychological effects:

• **A sound** level of 40 decibels can make a person nervous.

• **A sound** level of 80 decibels can produce nervous fatigue, headache and after-shaft shaking.

• **Derivative changes** and effect on hearing can begin at 100 decibels.

In more than 2,000 tests at this air base, none of the F-100 crews, Dr. Parfitt says, have ever had any fits, and also are believed to be having their hearing due to the effects of flight low noise.

• **Sonic Insanity.** Squealings at George have been operating F-100s prior to arriving F-100s.

Results of the tests thus far are inconclusive concerning the F-100. Dr. Parfitt says, "but indicate that there are certain persons not bothered by the sound, others considerably affected by it. This would indicate, he says, that sensitivity to sound might become one criteria in selecting new personnel."

Use of earmuffs, earplugs and blankets enclosing the head can cut the sound down to a tolerable level, he says.

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models RG 5000 (Illustrated)



Fuel filter pump
models RG 7200 (A) (Illustrated)



Fuel filter water separator pump
models RG 34900 (Illustrated)



Pressure switch solenoid
models RG 3500 (Illustrated)



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models RG 5000 (Illustrated)



Hydraulic oil sump pump
models RG 5000 (Illustrated)



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models RG 4100 (Illustrated)



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models RG 5100 (Illustrated)



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models RG 5100A (Illustrated)



Pneumatic actuating cylinder
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models RG 5000 (Illustrated)



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models RG 7200 (A) (Illustrated)



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Radar pump
models RG 10000 (Illustrated)

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F-86 SABRE JET is more powerful fighter-bomber with improved climb and range. Deeper fuselage houses GE J75 engine.

F-86F Sabre Undergoes 2-Way Stretch

Here's how North American spliced in additional depth for more powerful engine in F-86H, additional length for second cockpit in TF-86 trainer.

By David A. Anderson

Los Angeles—No matter how you slice it, it's still the power F-86F.

• Since the F is basically a splice to increase fuselage depth, and it becomes the F-86H, an improved fighter-bomber and day fighter, the resulting production model at North American Aviation, Inc.'s Columbus, Ohio, plant.

• Since the F vertically, add some fuselage length, and it becomes the TF-86, a座-instructor trainer with performance of the F Sabre.

Details of these two late modifications

turn of the basic Sabre airframe were sold to American West by engineers at NAA's headquarters here.

F-86H Sabre Jet

The F-86 is more of an airplane than the F, top North American. To climb, range and load factor, the F shows improvements all along the line.

It is an airplane to which the classic comment about picking up the gear and rolling in a new body could be applied, because with the exception of the landing gear, all the basic structure is different and strengthened.

Pilot who fly it should find right at home because it retains the handling characteristics of the F series.

Powerplants—the basic difference in the H is the engine, a General Electric J73-GE-27, rated at 5,000 lb. and nearly 9,000 lb. dry, increased static thrust.

This represents about a 50% increase over the thrust of that company's J47-GE-27 that powered the F-86F.



DEPENDED short supply was in to J73, small fuselage redesign.

Other changes—More power and fighter-bomber requirements spell out more fuel in the 21 cubic feet wing cell bay of the fuselage, but adds fuselage fuel for a total increased capacity.

• Side view of F-86H shows depth spliced into fuselage for more power by the J73 engine. Australian made under license in Avon Sabre.



SIDE VIEW of F-86H shows depth spliced into fuselage for more power by the J73 engine. Australian made under license in Avon Sabre.



FIRST F-86H on the experimental prototype line at NAA's Los Angeles plant.

Official measurements say the F-86H has the nosewheel in the standard arrangement of six 30-60-90 metric degrees, and a 100-degree turn. Extended turn base was originally intended. F-86Hs have been modified in mass to power for the H. Presently the plane has about 10% of the new M-70 23-mm intensity proximity cameras.

Rockets, bombs and other wing stores can be carried, and the company says that suspension and release mechanisms for these stores have been improved.

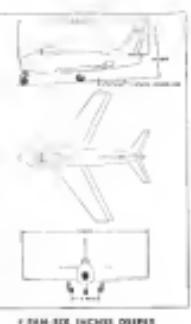
Change and research equipment remain the same as in the F-86F, but the duct redesign has meant a somewhat larger cockpit. The company says the layout is improved, there is a divided air intake jet on each wing. One other cockpit change is in the canopy design, now a channel type to replace the familiar sliding style of the earlier Sabres.

• New tail-in sonic respects the basic control and vertical tail surfaces resemble those used on the F-86D all weather interceptor. These are enclosed in the horizontal tail, which is the "tail-dragger" type preferred on the F-86E. It is about two feet greater than on the tail of the F series, giving greater roll control.

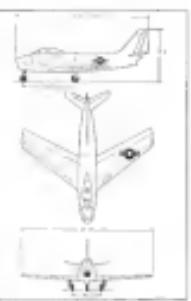
Power controls are hydromechanical for the elevator and ailerons; there is no power on the rudders. Controls are reversible.

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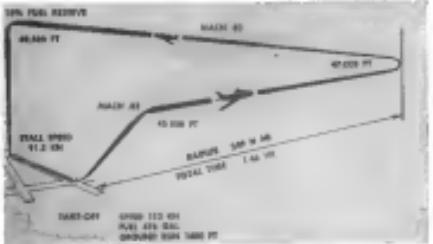
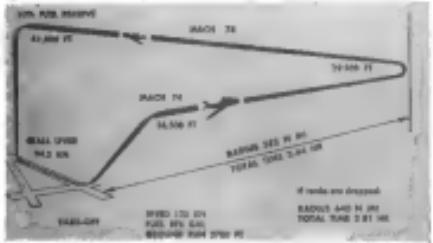
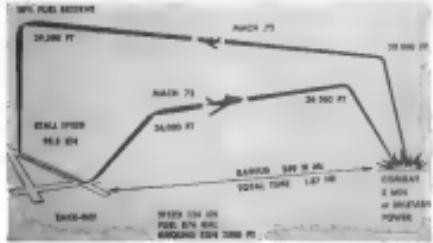
F-86 H INCHES DEEPER



F-86 H FEET LONGER



TF-86 TRAINER shows Sabre severity in basic form, stretched to include a second cockpit. Ventral fin is for additional stability.

BASIC MISSION (MODIFIED) (NO EXTERNAL FUEL)**GUNNERY MISSION (200 20-MM GUN TANKS REARMED)****FIGHTER BOMBER (TWO 100-GAL WING TANKS REARMED + 2 X 1000 LB BOMB PACKAGES)**

now in use on the F-100 fighter-bomber. The recent grounding of the F-106 fighter-bomber because of severe problems with localized fatigue did not apply to the B model.

TF-86 Trainer

Almost six feet in added fuselage

length to include a second cockpit makes the difference between the standard F-86F and the trainer version TF-86.

Most major assemblies are interchangeable with those of the F-86F, and the handling characteristics and performance capabilities are the same as those of the F-86F.

Now in a demonstration tour, the TF-86 is being plagued by North American's long-standing history in technical snags.

North American says the plane can be used for training missions for pilots, gunnery, flight-controllers and all weather instrument work. Because of its speed capabilities, the plane could be used for test target missions. In addition to all this, the company says the trainer represents a sound ready replacement for the bomber capabilities of the F-86F. Typical missions are shown in left.

F-86 Design

In this illustration of the F-86, fuselage length and cockpit side-plate are shown just ahead of the center of changeover.

Conventional tandem arrangement is used, with retractable at the rear and like can be made of what goes in because of a retractable landing gear at the front cockpit. The view for the student is improved in the side and downward, because of the forward position of his cockpit with respect to the wing.

Timed, interchangeable instrument panels and controls are located in the cockpit layout. These types of lighting, instrument ring, emergency foot, self-thrust levers are provided in each cockpit.

Control power from authority to student is limited by switches on the avionic equipment, the instructor has the usual override which gives him the last word in who's flying the airplane.

NAS engineers have simplified the operation of equipment, consistent with the role of the plane. Fuel selection switch is either "off" or "on," with no concern about alternate tank selection. There are separate controls for heating and ventilation, and cabin pressure. The only single warning light switch for all warning lights.

Electrics from the trainer have been simplified, as in emergencies, the pilot uses either handpump to blow off the canopy, and then operates the trigger to open forward. Lap-seat harness and parachute opening are automatic after ejection, but may be operated manually.

If the canopy stays with the aircraft instead of blowing off, ejection can be made right through the hatch.

Another Interest—Presentation of the TF-86 to the Canadian Forces at the CF-106, the same engine as in the F-86F, used at 6,300 ft static sea level military thrust, says NAS. Maintenance will be a factor, operators believe engine and controls are identical to the F-86 standard.

Anodizing, the aircraft must withstand the early number of the T series because it returns the plated wing. (Later models of the T were equipped with a lead leading edge for extra area and better maneuverability at altitude.)

Full-power, irreversible controls with

BLEED AIR REQUIREMENT

Of particular interest is the way the twin turbine configuration of Hydro-Aire's new Frijadrive System allows the individual optimizing of the refrigeration turbine while tailoring the other turbine to best

performance throughout the power requirement range. By utilizing two turbines instead of one, optimum design for refrigeration turbine while tailoring the other turbine to best

weight and cost. Conversely, additional power demand is not penalized by cutting off bleed air flow through the first engine. Only the refrigeration turbine is coupled to the first (driven) engine. (2) increased heat pressure ratio (area 17 inches ahead goes overhead).

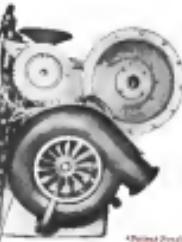
Most efficient outcome. The design,

as shown in the drawing, is a bleed air system. "We believe Hydro-Aire has made another remarkable contribution to defense applications," says R. H. Brooks, President.

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Another good reason why
of all the World's International
Airlines... it's out of 10 use

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AVIATION PRODUCTS



of a flight is negligible, Navy says.
The suit was designed by Leonard
Soley, project director.

THRUST & DRAG

The JC estimator is an accurate description of a flight path needed to impose weight. It has been used to measure deceleration in short, bitter Anglo-Saxon wars and in the flowery pleasure of flight test reports. Here are the words of a Navy Lieutenant on exchange duty, quoted in Naval Aviation News after his first ride in a North American Aviation F-86D.

" . . . and there I was in takeoff position. . . . I went into afterburner (which put about fifteen thousand feet) and I released the brakes and the next thing I knew I was in the air going straight up."

"After getting the gear down I leveled off at about 1,500 feet in pitch up climbing speed. Not real low because I got into it, but not like the boys did only some so. Up until then I'd wondered what the term 'JC' meant."

"After it was all over, I was over. He was with me and he helped me out. I believe I pulled as a little kick back switch (or delayed). I didn't get an immediate response, so I used back on the stick, and at the same time the nose rack held. At this was too much back stick, I pushed it forward rapidly and then I was . . ."

"He was over, and he pulled on a solid Beltsafe belt, and I'll have more info on the JC in a Dog. These were only four or five violent oscillations, but they were enough to send the aerodynamic to minus two and plus eight Gs, and less about 4,000 ft. of altitude."

"When I recovered by cutting out of afterburner and breaking loose the stick, I was upside down in a nose-down attitude. Being so big, I was able to almost everything in a straight with the doors open. I was in a spin. I was in a habit of always flying with it locked. I believe it really paid off this time. I was steadily thrown all over the cockpit and seat for a week afterwards. Had I not been securely strapped in my seat, I surely would have been severely beaten up."

"Extrapolation is the brittle point of error."—From transcripts of testimony during the Comet inquiry

"Military pilots use only three thermal protection—Oil, Fall Thermal and Bend Over."—Alfred General Electric presentation by H. T. Richman of GE's Small Aircraft Engine Dept.

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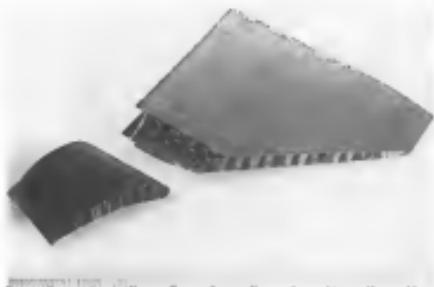
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BAZING OF SKIN TO CORE makes possible aircraft honeycomb composites. Experimental park sheet at left during sawing and made to actual size expand core. Afterburner duct, right, is believed to be largest component yet made of this material.

All-Metal Honeycomb Beats the Heat

By Irving Stone

In the long line of accumulated air vehicles, high-strength, low-weight aircraft materials never have been less needed.

Now, the present jet and rocket

design for aircraft and missiles introduces a new factor—temperature—an consideration of material strength and weight.

► **Hotter.** In and Out—Temperature is being tested both inside and outside of aircraft and missiles. Increasing

speeds are causing skin temperatures at a rate of six fractions and compression loads the vehicle, jet engines and afterburners, transports and rockets are great heat sources, which must be dissipated, which must be accommodated with temperature-resistant materials.

This is where aircraft honeycomb comes in. At 900° F. aluminum plates and after-burner ducts are most popular for higher-temperature applications because of strength and modulus-resistance characteristics, but their relatively high weights pose a problem. This problem may be circumvented in a number of applications by the use of lower-resist materials.

► **Solar's Studies.** All-metal honeycomb sandwich construction, so new that no known applications have reached the production stage, is now offering a practical solution for elevated temperatures up to at least 1,200°F. A development program to produce such honeycombs is part of the series of high-temperature, unchallenged materials research underway at Solar Aircraft Co., San Diego. Honeycomb sandwich, using adhesive lighter than metal, bonding of skin to core, has been produced in a test application at the Martin B-57 Matador cruise.

Current studies on all-metal and metal construction include basic design, new materials and increasing numbers of bearing material studies, production having techniques planned testing and service evaluation.

► **Possible Uses.** Data on high temper-



WELDED SPINCCELL uses end step. The core takes 2- and 3-dimensional curvatures.



FLEXIBLE CORE DESIGN—left, finely textured random cell core; right, uniform core stabilized with longitudinal fibers.

atured doors, heat-shield liver blocks, aircraft fuel tank structures, fire walls, airframe structures.

► **Monel.** One heat is projected for glass, tile, and asbestos, and ratios of strength to weight are being improved. The resulting structures, they expect, exhibit those desirable properties at elevated temperatures.

► **Characteristics.** High temperature, all-metal sandwich structures can be fabricated successfully, using special bonding techniques. *Load and Creep.* The resulting structures, they expect, exhibit those desirable properties at elevated temperatures.

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► **High strength-to-weight ratio.**

► **Extreme high-temperature factor.**

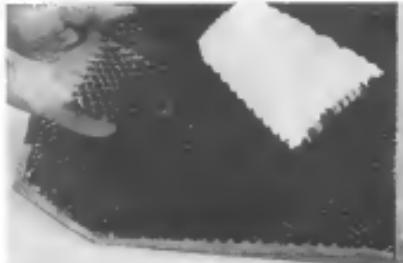
► **Good thermal resistance.**

► **High vibration damping ability.**

► **Excellent fatigue resistance.**

► **Anisotropic vibration resistance.**

► **Sandwich Details.** A high compres-



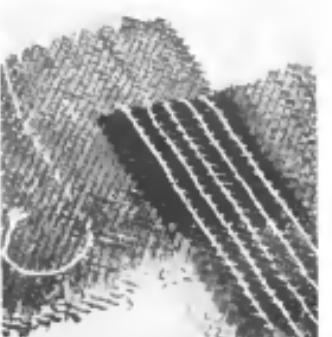
TWO APPROACHES TO CONTOURING—left, over-in from the front for sawing; right, over-in adjusted to expand material



OPEN MODE passes hot air or heat trade box



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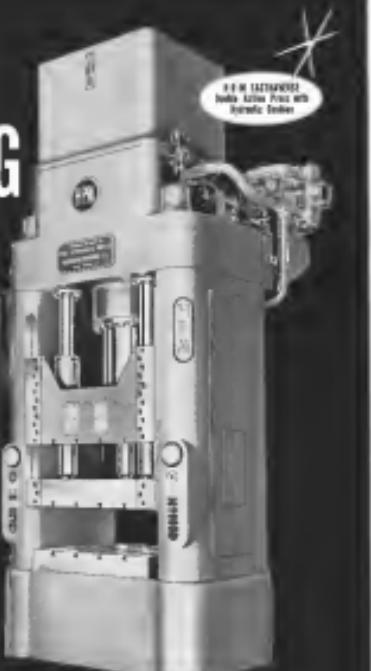
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第10章



COMPOSITE HONEYCOMB SANDWICH shows after rocket boost test. Top honeycomb is filled with aluminum powder. Tests with other substances are planned.

ent, all orbital honeycomb structures based on an anastrophe (different properties along different axes), integrated sheet music usually. Polythiophene arranged in honeycomb pattern impinge the core, undivided music without words from the prime line starting members.

By proper design, complete surface interlock permits ultimate compression strength to be realized, even in the thinnest gauge wires, they say. The wires provide continually continuous support for the fibers to prevent buckling under compression, while at the same time transmitting shear stresses.

The resulting structure achieves an extraordinary high strength-to-weight ratio. Excellent stiffness, vibration damping, thermal and acoustic insulation

How Honeycomb Is Brazed

Chas, depressed and, occasionally, yellow metal surface, are specified. Braze alloy is applied at a greater powder or compound quantity directly to the base metal and is held in place by a volatile plastic solution. Small amounts of tape and flux may be applied during this operation.

Professor, I respectfully suggest the feasibility of applying the basic film material to a plastic film or tape. This film is placed between one and three sheet, and due to the remarkable fast flow of the alloy during heating, only one sheet

All serial sandblasting regimens equal equal 100 and 1000 grit throughout each stage of sandblasting, especially since even minor repairs to a bonded pixel frequently are proliferative. Actual sandblasting fabrication involves, among other details, three primary steps:

Proper pre-portioning of hazing alloy off the
Cessation predominating of strenuous exercises
and forces
Assurance of the availability of the
hazing being pain of opposition, with
well-timed reaction between force and
time
Controlled hazing and dosing rate in
event weapon and evasion of the pest
Maintenance of adequate atmospheric
conditions to ensure a clean, well-ventilated
and bright and high-quality house surroundings
Controlled partial tooth treatment oper-
ations to develop controlled molarized
surface within the toothbrush materials
Grazing, incising, or other plastic de-
struction of the brand panel to develop
cavitated pest and/or to effect strengthen-
ing in cold work.

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apparently for professional advancement an expanding flight through experiencing a variety of roles engaged in developing, implementing and flying out of research, development and flight oriented equipment, structural design and other analyses as required.

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Valve Talk

Ice WM. R. WHITTAKER CO., Ltd.
By STANIS LIND,
Senior Member, Aviation Writers Assn.



Whittaker is ending its progress payment program—and extending a sincere "thank you" for the cooperation of half a hundred major customers.

No new orders accepted by the company since November 1 have been subject to such payments, and effective New Year's Day no progress billings will be submitted against any orders.

Termination of the program is the result of constant and conscientious Whittaker effort to establish this financing method, an objective that has been attained at the earliest possible date.

It was late in 1953 that the company—growing to ever-expanded production—found itself "in the middle," so to speak, faced with skyrocketing defense orders, but unable to maintain the constant inventory increases required by such production, roughly two and a half times shipment value.

This was "tight" production, never from stock, but soon stood firmly for maximum orders, the result of unique design, engineering skill and maximum design ingenuity.

Instead of cutting delivery production, the company's management worked hard to meet the burgeoning demand and sought an increase in V-Lines, already responsible to cover almost double delivery.

Following under the V-Lines came the company's program: 30 days after a design was submitted, 10 percent of payment clients were being paid (90 percent went mostly on the basis of applicable inventory in process, incoming fiber, factory facilities and engineering and administrative overhead).

The billings did not include new material, parts or equipment, or parts or power parts, approximately 45 percent of Whittaker's total inventory.

The losses need the progress payment can be seen in the company's bottoming business which recorded sales of just \$4,000,000 for fiscal 1951, \$11,000,000 in 1952, and \$23,000,000 in fiscal 1953—a total increase that was fastest and sharpest coming to require an average inventory worth over \$10,000,000.

In other words, a small company with a limited inventory of the most basic business positions of all kinds had to delay delivery to deliver on demand was forced. Fortunately by then very extensive new progress payments to continue a vital production job.

Observations by the Whittaker management were concentrated in some instances, but in each of these cases the plan was accepted after the engineer had been given a full explanation of the financial situation facing Whittaker.

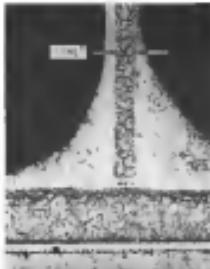
Once emerged in the plan, Whittaker did everything in its power to conduct the program as smoothly as possible, even engaging commercial financial institutions in the Billings and V-Lines, and not alone—until results came through financing the stated overhead.

In response, nearly the company's financial partners were convinced—initially, at least—to operate the program on a "no profit, no loss" basis, so that the overhead of the program could be minimized. In the spring of 1953 billings were already exceeding, but it soon became evident that the inventory burden was still too great.

In the fall of the same year, however, after payment of Federal customer and vendor payable taxes, Whittaker was able to reduce the progress payment program and by adoption of cash payment, to the extent that the company tax presents to pay in February of this year complete liquidation of the program could be undertaken.

The analysis was accurate, the analysis verified.

President Bob Whittaker has informed the management of the company of all the progress payments—and expressed the company's most generous appreciation for understanding and cooperation on the part of those who buy Whittaker valves.



IDEAL CORE-TO-FACE IDENT desired in high-quality materials.

Strength per unit weight versus temperature—the superiority of 37-193 stainless steel is evident below 1000°, while higher temperatures indicate the use of Inconel X, extreme temperatures require L-633.

► Core Making—Steel and high-alloy stainless steel, usually in monolithic or square, hexagonal, hexagonal, or wire form, are types, although many other special core designs have been produced experimentally.

The square cell honeycomb core is manufactured in the fully open condition, so it may be collapsed if grinding or machining operations are required. Such straight cell cores are stabilized—the core assumes a saddle condition when it is bent in single curvature, the exterior corners first becoming concave in a direction perpendicular to the handles.

Another interesting core, suitable for high-strength weight savings, is known as the ring core. The longitudinal and transverse ribbons are each folded half way, and assembled flat to flat. This configuration results bending completely along the longitudinal and transverse axis, while intermediate bending between these directions is much smaller, the notches so.

There are two types of cores in general, saturated fiber sandwich cores having severe two- or three-dimensional core curvature, the authors claim.

► Cored Applications. A number of unusual applications have been developed, particularly to accommodate varied sandwich applications. A core with extreme compound curvature characteristics, involving a highly extensible cell configuration, is known as Waycoll (Solar experimental core).

In addition to the one, two other

Freedom's Team

At the opening of freedom near the Arctic Circle—made possible by our agreements with other governments which stand with us against aggression—U.S. Air Force men are now standing around the clock, round-the-calendar guard. Backing them up are the resources of American science and industry which have produced the Northrop Scorpion F-89 all-weather interceptor. The F-89 is America's heaviest-armed fighter. Missiles are coupled with the latest electronics to make the F-89 a deadly aerial destroyer, capable of striking a boulder 45,000 feet and more above the earth. These jet home defenders are one of many modern weapons created by the engineering and production complex of Northrop Aircraft, Inc., since 1939 America's first company in the vital design, development and production of all-weather and jet-powered aircraft.

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... and
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we
built

the main rotor transmission
for the S-55 Sikorsky Helicopter.

High on the list of "things we are proud of" at IGW is the transmission shown here (demonstration cutaway). Precision built to transmit 700 H.P. with an input speed of 2400 R.P.M. and a reduction ratio of 11.54 to 1. In spite of high stresses and great complexity the service life of this transmission has been outstanding.

INDIANA GEAR

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flexible configurations have been employed in high temperature, all-metal applications. Gas has a freely energized melting temperature in upper-cell fusion, exhibiting great fluidity. The effect, known as Melatene (Nimonic), is stabilized by longitudinal ribbons.

Another one, known as Stenwell (Solar experimental cast), permits two- and three-dimensional curvatures of a lesser degree.

Adhesive bonding and resistance welding are the two chief methods of assembling ribbons into core. Other techniques include wire drawing, extruding, slotting, and slotting.

Another process starts with a single sheet, makes core material in a furnace similar to the manufacture of "expedited" metal. This type of core, being open at the nodes, holds promise for applications where fluid flow and heat transfer between skin and core is desired. Skin support is provided somewhat because of the open nodes along periphery. π is small.

► Close-up Machining—Machining an opening that has been machined out of a casting that has been machined out of a casting of the core can be considered a problem. But if it cannot be eliminated or if the solution is to be considered, a problem results, since tolerance for layout must be within $\pm .001$ in.

Several solutions have been found in position. Long and Carter point out. One method forces the expanded core in to a slot, with sealing done at sub-freezing temperatures. Another technique uses a plastic composition to hold the core by restraining. Electro-discharge machining is another machining technique which has proven feasible in production, the authors say.

► Bonding—Steel plated, tensioned and machined studies have shown that the load between face skins and honeycomb core can be at optimum strength in all metal subcores.

Two principal approaches were investigated, the authors report. There were welding and bonding. Attempts at solid plate welding were unsuccessful, due to a combination of low diffusion rates, inadequate core strength and poor heat transfer characteristics. There also, bonding studies have dictated possibilities and new techniques and refinements should be explored, if it is used.

If honeycomb sheet on top of all the setbed areas are prepared for bonding, if the method is properly controlled, it proves high bonding strength.

Solar has developed the Selenium line of high-temperature base metal for honeycomb structures. This has not satisfied requirements completely, the authors claim. In their opinion, they say, only boron nitride can transmute, high enough metallurgical joining of components. Due to the

flexible configurations have been employed in high temperature, all-metal applications. Gas has a freely energized melting temperature in upper-cell fusion, exhibiting great fluidity. The effect, known as Melatene (Nimonic), is stabilized by longitudinal ribbons.

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► Close-up Machining—Machining an opening that has been machined out of a casting that has been machined out of a casting of the core can be considered a problem. But if it cannot be eliminated or if the solution is to be considered, a problem results, since tolerance for layout must be within $\pm .001$ in.

Several solutions have been found in position. Long and Carter point out. One method forces the expanded core in to a slot, with sealing done at sub-freezing temperatures. Another technique uses a plastic composition to hold the core by restraining. Electro-discharge machining is another machining technique which has proven feasible in production, the authors say.

► Bonding—Steel plated, tensioned and machined studies have shown that the load between face skins and honeycomb core can be at optimum strength in all metal subcores.

Two principal approaches were investigated, the authors report. There were welding and bonding. Attempts at solid plate welding were unsuccessful, due to a combination of low diffusion rates, inadequate core strength and poor heat transfer characteristics. There also, bonding studies have dictated possibilities and new techniques and refinements should be explored, if it is used.

If honeycomb sheet on top of all the setbed areas are prepared for bonding, if the method is properly controlled, it proves high bonding strength.

Solar has developed the Selenium line of high-temperature base metal for honeycomb structures. This has not satisfied requirements completely, the authors claim. In their opinion, they say, only boron nitride can transmute, high enough metallurgical joining of components. Due to the



Dissatisfaction— AMERICA'S GREATEST ASSET

American pioneers depended so much on their axes as on their guns. While an ax was useful, a hatchet was still a crude construction tool. Progress demanded faster cutting tools, tools that would reduce costs and increase production. With the development of the power driven ax, this was a veritable step. But even more significant was the urge in men's minds for better tools.

Today, at Melatene, we are constantly testing new materials for new and better products. Dissatisfaction with what we have done, plus a determination to improve, is America's greatest asset . . . and this is a guiding principle at Melatene.



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String conditions heavy —
decreases working fine —
bonds on screen ...



Industries — P-51C, Lucifer, B-57B. All smaller Interceptors, now get Haydon's in a heavy area to screen clip resistors that could puncture its insulation or exceed allowed working stresses with pressure exerted through use of a pinhole. In result the enemy — through air and atom — whenever and whenever he may attack — need to knock him out of the sky.



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7200 series repeat cycle clamps and
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Designed for aircraft in power for 10-15 minutes, carrying 2
above 400 cycle service to the limit in 10 more minutes, providing
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temperature range of -40°F to 140°F .

The heat pulses have a contact rating of 10 amps at 200 milli-
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100 rating — 1000 cycles
Instantaneous, special heating — Full Safe Service

Home! Coming Soon to Russia!
When flying across a problem country ...



Design and Manufacture of Pressure-Sensitive Timing Devices

distance of 10 feet between working surfaces, greater bond area results with attendant uniform stress distribution.

Also, due area spanning each cell are further stiffened or stabilized—a significant advantage when relatively thin foams are employed, it is pointed out. The breather also stabilizes the side lips with consequent sharp improvement in fiber column and shear properties.

With more basic material, used with stronger base fiber, but again minimum radius at a pragmatic such ratio.

• Integrity, Inspection—Because high-temperature, stretched sandwich applications are based on the ability to develop very high strength about perimeter base, integrity appears mandatory, it is claimed.

The most significant single factor to insure this high strength is the accurate nature of intimate contact of components throughout the bonding operation. This must be done simultaneously with achieving the desired structure. In fact, which may be a source of trouble in applications on both surfaces—a difficult combination, especially since bonding temperature is at the region of $1,900^\circ\text{F}$.

Frequently, initial stretch can cause to fluctuate from one flat panel, but this has established satisfactory production standards on flat panels at large as 24 x 60 in.

While non-destructive testing should and has not been established for all-metal honeycomb structures, there is good reason to believe that practical solutions to this test problem are possible, the surface situation.

Because the outer surface of base plates is the structure it has experience that active, cyclical load, and resulting interlaminar bonding loss or even local bond X-in and some methods hold real promise for determining fiber existence in all metal honeycomb structures, it is pointed out.

• Physical Properties—The authors of part three characterize

• With high-temperature bonding, strength of all-metal honeycomb should not decrease on low-temperature.

• Compressive strength of the sandwich is usually independent upon cell design. Increasing gross thickness of cell configuration of material, values as high as 4,000 psi have been obtained in 2 and 100 psi low cell core.

• Creep properties of high-temperature bonded sandwiches is superior to adhesively bonded sandwiches at all temperatures. Tests up to $1,650^\circ\text{F}$ have shown Soloflex bonding methods to have no effect upon resistance.

• Excessive impact strength of all-metal sandwich has been indicated by battle damage experiments. On shock-type

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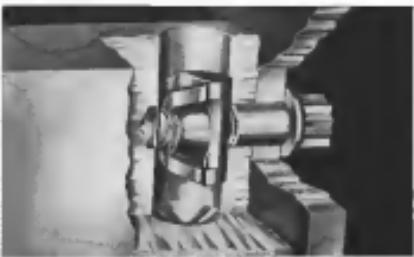
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FASTENER PROBLEM



Reducing weight and saving time in joining major substructures

Use of a hot slotted or V-groove type fastener to join major aircraft substructures and main landing gear struts has been proposed. The proposed fastener is intended to provide [1] a saving in mounting time and [2] a reduction in weight, both structural and an accompanying high percentage of manufacturing reduction. Simplification of these fastener operations has long been an objective of every major American aircraft manufacturer.

ESMA type 2020 is the simplest and most efficient solution to this problem. Fast, the shape of the slot fits into a single drilled hole... the fast does not have to be driven for insertion. The hot slotted or V-groove type fastener is completely eliminated. In using this proposed fastener, savings in weight of the fastener or structural members or in flight can also be obtained.

Second, a floating action of 0.020, perpendicular to the axis of the fastener slot, is designed into the slot. As a result, a much more uniform expansion is required for installation.

Third, a steel clip is required which wraps on the slot end when the slot is inserted into a hole. This clip is required to hold the slot end in the proper position to reduce the load. Fourth, to meet the tensile requirements of the aircraft, the slot width must be kept 16.66 mils at the width character of the hole.

Fifth, type 2020 is made lighter in weight by using an aluminum alloy crimp to support the slot end.

Sixth, this new high tensile floating slot slot and crimp is self-locking, owing to progressive vibration proof self-locking performance and extended life-availability.

Do you have an assembly problem that new type 2020 can solve? If so, write in to us through Avia-File, the Avia-File.

MAIL COUPON FOR DESIGN INFORMATION

Atlantic City Corp. of America
Dept. AVF-1225, 3220 Vassar Road, Union, New Jersey

Please send me the following fastener information:

- Atlantic City fastener
- Esma fastener
- Esma lock fastener
- Esma fastener problems

Is there a drawing of our product?

What self-locking feature would you suggest?

Model:

Size:

Weight:

Size:

Size:

Size:

honeycomb panels subjected to a 28-mm projectile, it has been found that the extent of damage is localized and that the parting is limited at the cell wall joint.

While physical property data for design purposes of metallic honeycomb structures will not be made available until late spring, data prepared by Wright Air Development Center at such places as the Forest Products Laboratory, U. S. Dept. of Agriculture, ►Sohr's Findings—In conjunction with aircraft fastener development, Sohr is conducting a planned testing program. Long and Cramer point out that strength values are dependent upon a given loadpath damage. For a spar-like case they mention a test fixture profile 4 in. thick constructed of 13-17H1 steel with .303 in. x .06 in. square cell size and .015 in. walls.

Physical property checks give these representative values: tensile strength (tensile, after heating) at room (71°F) is 175,000 psi, 144,000 psi at 1,800°F, 102,000 psi. Edge compression for the same temperatures are, respectively, 186,000 psi, 158,000 psi, and 82,000 psi. Flat compression values for these temperatures are 4,000 psi, 2,600 psi, and 1,300 psi. Maximum core shear for the same temperatures is 500 psi, 400 psi, and 200 psi. ►Aptitude—A number of aircraft manufacturers are in various phases of development.

►Afterburner shield. A broad, high-temperature honeycomb sandwich and heat loss shield set in close cooperation with a leading nozzle manufacturer. The design involves a stand-off self-supporting afterburner shield around a flappet that runs above 2,000°F. Both insulation and selective heat barrier properties were derived in a strong, lightweight, fatigue-resistant structure. Experience with solid sheet metal has shown a sandwich metal matrix temperature range from 150 to 900°F. Solid metal parts are 400°F.

Reported successful in flight test under severe conditions, the shield is the largest commercial all-metal honeycomb sandwich structure known. Made up twelve eight-cored panels surrounded by edge insulation to form a split basket of an afterburner tube 3 ft long by 2 in. in diameter. Total heat effect exceeds 15 linear miles for the overall shield. Panels are small, well proportioned. Base metal comprises about 20% of the overall weight, inscribe of 80%.

While the design specified 403-4, A325-321, aircraft grade, the weight for weight attainable only is 0.670 in. (90%), introducing a weight penalty of 14%.

The thin-sleeved honeycomb sandwich accounts for only half the 28 lb. of total weight. About 14 lb. of metal



stars* in their orbit...

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for soil temperatures in the range of 1,000 to 1,700°F.

Another variation of soil nuclear reaction involves the application of explosive heat sources with turbine blade blade tips, to form a self-firing combustion.

*Shaped sandwich. Extensive applications requiring enclosed cores need both practice core engineering methods and special assembly techniques. Long and Cross.

Representative shaped parts fabricated successfully with high-temperature bonding include a housing case and assault fan sections. These were mechanically machined using plasma support methods. Wire explosion of such contained sandwich is predicted for such areas as leading edges, fan, control surfaces, slots, and turbine vanes (see 22).

Another type of three-dimensional sandwich, with special Wright core, is a smooth-faced cap with an outer radius of 31 in. and a core thickness of 4 in. Both faces and core are 302 in AISI 321.

Because of the exceptional metallurgical bond strength of high-temperature bonded parts, it has been found feasible to sandwich-faced bonded, the authors reveal. Flat sandwich specimens, 4 in. thick, with AISI 321 0.02-in. skin were bent to radii of 5 in. to 7 in. Maximum permanent set for these particular sandwiches was roughly 15%.

Reuse standards have been attempted with shotblasts of 1/16 or more. Soldering temperatures are sufficient to decompose plastic deformations.

*Conical structure. Conical shaped parts are frequently encountered in missile and aircraft construction. Applications where alternate sandwich may fit include nose at different, during, tailpipe threads, engine needles, and assault fan sections.

Simple truncated cone designs are readily amenable to sandwiched and welded structures. Double cone, or two truncated conical sections, are feasible but require careful preparation of the sandwich components and solder re-torque tooling, it is revealed.

*Flat panel. An experimental all metal sandwich for use in a rocket heat shield has been devised. This panel has a central structural sandwich base, on which is superimposed a refractory, fiber heatshield face and face skin. Purpose of the refractory face is to resist extremely high velocity, high temperature exhaust gases for heat periods.

In a sheet metal heat shield, the 4-in. radius of curvature of bottom otherwise cyclically stressed magnetized iron an abutting the transition block, presented real heat. By reason of heatshield constrictions, the refractory withstands the heat without cracking as



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take three landing shocks,
partner four mainwheels.

TIMKEN® bearings take 3-way landing shocks of world's fastest sub-killer

WHEN Lockheed's new Neptune comes in for a landing, its landing wheel bearings have to stand up under 5-way punishment. The radial shock absorber created by the landing gear, radial acceleration of the aircraft, and very rough decks and the threat shock loads resulting from cross winds.

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lading of the Neptune's wheels. Timken bearings are designed to roll true by geometrical law. And they are precision manufactured to live up to their design.

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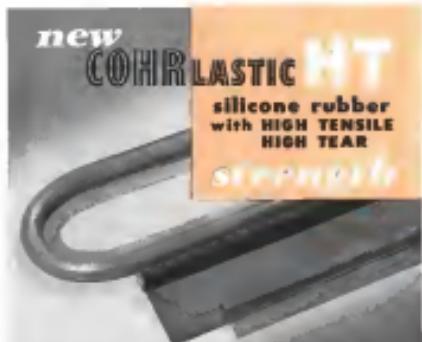


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Resiliency, low compression set, simplicity of installation and low maintenance cost are some of the exclusive characteristics of this important new development. And the applications are many—steel decks, concrete decks, flexible decks, railroads, canopies, bridge decks, to name a few. Durability and economy clearly are evident.



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CONNECTICUT

Further development of composite sandwich blunt panels is planned to assure complete protection of the structural base sandwich. Impaired thermal shock and erosion resistance is anticipated by using a special graphite flang in place of the semibrittle silicones.

PRODUCTION BRIEFING

► Aero Manufacturing Corp. has established a West Coast division, with headquarters at Los Angeles, for sales and service of the company's defense and industrial products, including electronics, avionics components and precision parts of all descriptions. Director of the new division is James B. Korn, former USAF colonel and chief of AMC's legislative liaison division.

► Pacific Tribe Co., Los Angeles, has broken ground for a major expansion of its stainless steel tube picking facilities. The construction, which will double the firm's present capacity, will cost approximately \$200,000.

Ultrasonic vibration speeds up visible penetrant inspection methods. Medi-Check Co., Los Angeles 47, suggests Highspeed vibration accelerates penetration, water washing to remove excess penetrant dye and development of film residues. The compact, economical equipment also comes in handy for surface cleaning prior to painting, plating or other processes.

► Accept-General Corp., subsidiary of General Tire & Rubber Co., plans to spend several million of dollars in expanding its plant at Nilesboro, near Sacramento, Calif. Several hundred employees will be added in the next year and a half. Present employment is 750.

• **Flexible Tubing Corp.**'s expanded West Coast operation will be located at 12130 W. Olympic Blvd., Los Angeles. The firm's main office and plant are at Encino, Calif. The new facility occupies about 4,500 sq. ft.

► American Machine & Sewer Co., Inc., Yonkers, N. Y., has been named exclusive distributor for Brown vertical sailing heads in all eastern states.

► Blind employees of the Gwinnett plant of Georgia's Factories for the Blind have installed some \$60,000 worth of small aircraft parts in the past 32 months for reuse in 87 production aircraft. Lockheed Aircraft Corp.'s Marietta facility, at a per-unit cost of \$47,000. The items included about 42,000 lbs of wire, bolts, nuts, fittings and other parts.



Experts Tackle Traffic Control Problems

* ANDB plans to apply the systems approach to development of navigation devices, conference hears.

By Philip Kline

Baltimore—The Air Navigation Development Board is sharply reversing its approach to the development of the Common System of navigation and traffic control slated for use in the 1983-70 period.

ANDB intends to apply the "systems engineering" approach instead of the "patch-quail" approach of trying to integrate a series of separate, incompatible and often incompatible systems. The Board is already busy assembling a group of military and civilian experts to do the various engineering jobs.

First disclosure of the new ANDB philosophy was made by James L. Ansett, chief of ANDB's newly formed systems engineering group, during a news press call here at the recent East Coast Aerospace Electronics Conference.

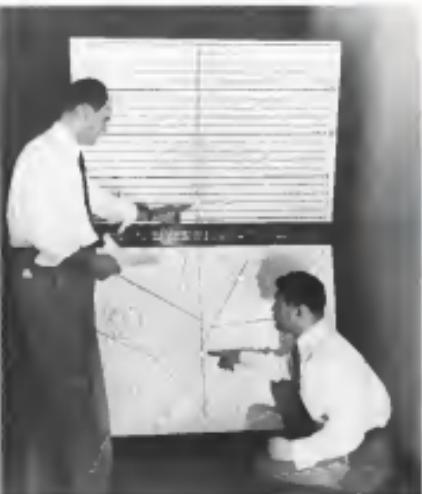
Other panel members at the press conference on air navigation and traffic control reported on:

- * New traffic control display which simultaneously shows aircraft search position, range, altitude, identification, speed, designation, and estimated time of arrival.
- * ANDB helicopter avoid shading for both forward and rearward viewing.
- * Progress and problems in ground radar and fire control control.
- * Sonobuoy techniques employed to solve air traffic problems.

The Systems Approach

The use of systems engineering to tie out-based instruments and to specify how to achieve the required goals for each sub-system is an evolutionary, not an革命性的, approach. ANDB is in a position to move rapidly once an industry and the military, Ansett pointed out. Aircraft weapons and guided munitions are two examples. Ansett believes that the complexity of the Common System is no greater than to design the same type of systems approach.

In a sense, the new philosophy is actually a return to an old one that existed when ANDB was formed more than five years ago. At that time, ANDB assembled a competent group of



NEW RADAR TRAFFIC DISPLAY, shown in mock-up form at electronics meeting, will have low-contrast PPI for showing aircraft position and range (lower) and altitude and position (upper). Data indicator (centered, between the two displays) will give flight plan information on the plane under the vertical (gray) cursor.

engineering staff under Dr. Douglas H. Bering. But this operating philosophy went by the board less than a year after ANDB was formed when the military service left unapplied to newly selected personnel their own individual technical and program goals, and started out by itself ANDB to develop its own systems. The patch-quail approach of trying to integrate independent developments into a system has run its course.

* Competitive technical solutions to the same problem are not evaluated soon enough to prevent them from moving into the hardware stage when their individual benefits appear to non-projective users. An example, Ansett cited the current DME-Timer con-



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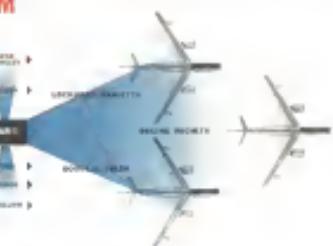
A PRODUCTION TEAM

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The paved and massive power of the Strategic Air Command force gives it a unique role in the security of military bases, shot of a dominant force for world superiority aircraft like these B-57s in readiness at March Air Force Base, California, expertly trained, materiel power and flight crews, advanced transports and dedicated leaders, make it America's most potent defender.



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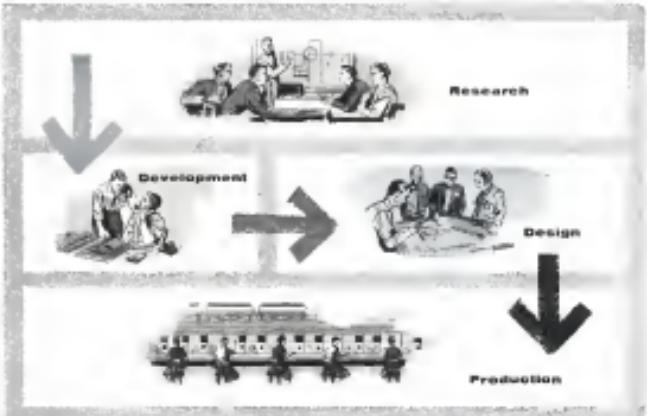
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It takes 13,000 horses to speed American Airlines' DC-7s on their nonstop hops across the continent. That's a lot of power to pull one plane—but, then, 365 miles-per-hour is a lot of speed for a commercial airliner. This speed plus the luxury of the DC-7 accounts for the fact that American has had to *spare* its new service in less than six months time.

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Hoffman's reputation for getting things done is due, in part, to the unification of Research, Development, Design, Production into one clearly integrated electronics operation. At Hoffman—united at the word—four completely separate operations—one technical director is assigned to manage each new project from start to finish. Every new project is developed in close cooperation with the division closest, including the potential problems of quantity production. This integration greatly eliminates the all too common duplication and overlapping of functions; the series and/or work caused by poor liaison, and naturally cuts down the total time lag between the testing of the prototype and actual production.

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their spectrum, possibly as a loan for a year or two. ANDB has also proposed that each service expand the group with non-combatants who can be made available in emergencies to provide assistance of effort. And the Air Force White that all four agencies appear anxious to cooperate.

"We suspect that the output of the group will be to solve the characteristics and the actual technical characteristics of equipment and techniques which fulfill the system design," Andret says. These characteristics will then define the base for development, experimentation, and evaluation by the various civil and military agencies under ANDB cooperation.

► Systems Lab Needed—"No avionics design group can function properly without lab and extensive system flight as presentation facilities," Andret pointed out. "We believe it is necessary that facilities of this type, both in government and industry, be available to carry on work at the behest of the system design group."

It possible, the entire system in major sub-sections may be put together physically and tested for final proof, Andret says.

New Traffic Display

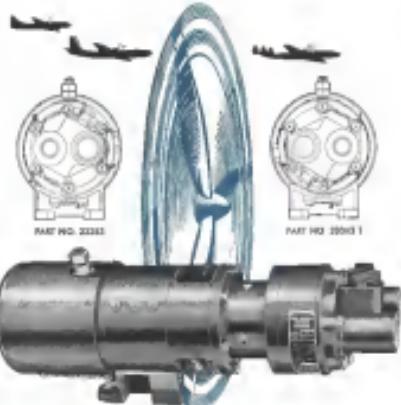
A new type of display which shows aircraft position in three dimensions, as well as other pertinent information needed by traffic controllers, was developed and demonstrated to mock-up teams by W. O. Arnold of Bell Telephone Laboratories. Mr. Arnold is developing the new traffic light system under ANDB sponsorship.

► Position Displays: The display will consist of a commandable TFI (trip, showing strength, bearing and distance, plus a second display, stop the TFI, showing aircraft altitude and last component of the aircraft movement).

Data reduction, such as those made by Utterback and Sogard, will be inserted between the two displays to give the ground controller information on an individual aircraft's destination, estimated time of arrival, and expected other aircraft flight plans.

This data will be filed by the pilot at the start of a flight, then transmitted by teletype in a large message containing data such as the unit number, undergoing CAA evaluation, etc. to adequately sort routes. This device, developed by Engineering Research Associates, can store up to 3,000 flight plans and produce one of them in a fraction of a second, when interrogated.

► New Display Will Work: When a plane enters the radar surveillance area and appears on the TFI, the ground controller establishes its identity and its location and altitude. Initially this will



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Model shown is an explosion proof pump of Specification MIL-E-5370, Section 4-13.

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be done by voice communication. But currently it can be obtained automatically by means of transponder buttons and other electronic devices.

The controller then generates a vertical cursor photo a 500 mils \times 4 is aligned on the particular aircraft's FFI logo. He need not do the cockpit's identification and its distinctive attributes, then depresses on "zapout" button. This will cause the following to take place:

- New blip will appear on the upper scope display under the cursor line at the approximate altitude level of the aircraft you acquire.
- Maintenance data will be as interpreted automatically for the full flight plan of the aircraft which will be displayed on the data indicators, showing the controller the plane's time of departure, ETA, destination, alternate airport, speed class, and similar relevant data.
- A track-with-scope computer, in the driver's cell box, will track the airplane's radio signal and track it automatically. As the target moves on the FFI, the track-with-scope computer will cause the plane's blip on the upper scope to follow it in order to so to always keep the track above the corresponding blip on the FFI.
- Cursor, track-with-scope computer, magnetic memory drum, and the blip on the FFI scope will be synchronized so that whenever the ground controller pushes the cursor over that same target on the FFI, the flight plan information for that particular airplane will be extracted from the magnetic drum and automatically displayed on the data indicators.

When the cursor is positioned over the FFI blip of any other aircraft, the controller need not the data indicators will change to display that aircraft's flight plan data.

Until such time as an automatic altitude reporting system or height-finder radio beacon come into use, it will be up to the ground controller to obtain wire reports of changes in altitude, altitude, and peak altitudes to insert these changes into the entries and the top altitude display.

• **Mark West Reasons**—The new ETL display is in the very early stages of development, but it will probably be another two years before a working prototype is available for evaluation. Arnold told AVIATION Week.

ETL also extends to investigate possible new techniques for the FFI and altitude displays. This includes both a projection CRT matrix and the new direct-view storage-type CRTs.

Copter Aids

Current thinking in the ANDB is on the requirements for helicopter terrain



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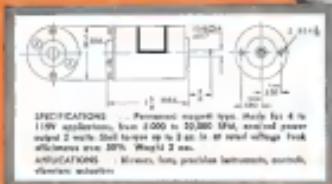
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new seal on radio navigation aids, and new components required to make these seals, were outlined by Code W. W. Eddy of ANTRB.

• **Termed** **Area** **Adv.**—An armament approach and landing system for helicopters. Both mid, should.

• **Be self-contained** and **mobile**, have

minimum weight and size. 15. figure at 35 lb. is frequently mentioned. Both mid.

• **Permit** **non** **non-visual** **landings** under

conditions of 30-ft. ceiling and 400-ft.

visibility.

• **Allow** **approaches** **from** **direction** to

non-visual **extreme** **down** **direction**.

• **Give** **plus** **warning** **sign** **on** **his** **position** to the **non-visual** **approacher**, **relative** **to** **other** **caption**, **since** **he** **may** **already** **be** **locking** **on** **because** **of** **high** **winds**.

• **Keep** **caption** **under** **non-visibility** while

over **controlled** **area** so that a **controlled** **landing** **can** **be** **made** to the **nearest** **marked** **area** **in** **the** **event** **of** **non-**

visibility **during** **final** **approach**.

• **Provide** **adjustable** **glide** **path** **between** **the** **angles** **of** **2** **to** **30** **degrees**. (A **glide** **angle** **of** **6.7** **degrees** **is** **considered** **optimum** **for** **existing** **caption**, **based** **on** **approach** **speed** **of** **45** **feet** **per** **second**.) **30** **feet** **per** **second** **is** **an** **ideal** **condition**, **both** **mid**.

• **Arrangement** **several** **caption** **on** **final** **approach** **area** **as** **possible**.

• **Provide** **intensive** **approach** **through** **outlet** **coupler**, **if** **desired**.

• **For** **radio** **Requirement**—**Advising** **to** **both**, **the** **use** **of** **radio** **should**

• **Require** **no** **more** **airborne** **equipment** **than** **needed** **for** **the** **landing** **process**.

• **Front** **minimum** **interference** **of** **caption** **with** **final** **using** **approaches**.

• **Provide** **service** **from** **the** **ground** **up**.

The latter requirement appears to rule out present VORs, whose VHF operation is usually limited to line-of-sight. It is unlikely to low-altitude route, though, as VORs are used.

• **For** **VOR** **Coverage**—However, both pointed out an unusual VOR placement, caption. A VOR located atop Mount Bello, in the western part of Virginia, provides stable signals in the surrounding valley. In some places as much as 15 degrees below line-of-sight, and with two or more intervening hills, excellent VOR signals have been obtained. Limited data indicates solid coverage out to 60 miles at line-of-sight level.

The many possible VOR possibilities not previously considered, or may be simply a peculiarity of the Mount Bello installation, must be used. (The book *Navigation by Radio* by E. T. Tamm, published by the MIT Press, contains many propagation studies, down areas in consideration terms.)

Book reported that ANTRB is currently evaluating GCA, ILS, VDR, DMF, and the new taildragger Tamm for



Radiograph reveals several small cracks. These were chipped out and repaired.



Later radiograph shows cracks have been filled and removed.

RADIOGRAPHY

teams with Foundry know-how
to produce a sound high pressure valve body

To take its place in a 300 psi system, this steel valve casting had to be sound. So, it was checked by radiography, revealing the presence of sound inclusions. These were chipped out and the necessary repairs made—a second radiograph showed a sound, homogeneous casting.

This is another good example of the

way radiography is used to insure good work, avoid waste, and prevent service failures. It's another example of the way it can improve operations and increase business.

Perhaps you, too, can do this through the use of radiography. Talk to your x-ray dealer. Send for a free copy of "Radiography as a Foundry Tool."

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- To utilize the full value of these aerial highways, more and more airliners are being equipped with two Sperry developments: the A-12 Gyroplot® Flight Control and the new Radio Beam Coupler which employ these high frequency radio signals in aerial guidance of the plane. It's a combination that can't be equaled. To quote, the plane rides smoothly on an aeronautic highway, designed for your protection, they're

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helicopters use at the Navy's air test center at Patuxent River, Md. Bush added that realization of helicopter potential, tools as Rotorbot and Rotak Drives is being considered but not yet programmed.

(Recent announcement that Bell Helicopter's Pacific division has obtained U. S. rights to British Decca names to exploit its helicopter potentialities will undoubtedly hasten evolution of this equipment.)

- **Control.** Non-Navi Pedal—Based on parkway, highway results, the next, for ground based rails, is not farfetched, Bush said.

Bush and Veltz (line-slung) equipment "must overcome tremendous engineering problems to give courage to the ground," Bush said. Furthermore, the mobile railroads required involve costs that appear to be economically unacceptable.

"The low-frequency solution (such as Decca) sounds good until you assemble the interference of weather and traffic," Bush said. "But the mobile may also run the gauntlet of energy considerations," he said.

- **New Section Standard.** Project thinking, according to Bush, is that ANTRAC must soon begin the development of a new enroute navigation system. Some of the possible approaches include:
 - High-frequency radio, operating in K band or higher, used in conjunction with corner reflection or radio beacons on the ground. A similar solution, reported in Aviation Week July 13, p. 46, has been proposed by Frank Auer and Horace Peterson of Fessenden Helicopter Corp.

The mobile may have a range of only 10 miles, possibly less. Big advantage of airborne radar Bush says, is that it avoids expensive ground installations and permits heliports to make frequent enroute stops. Disadvantages are its size, weight and cost.

- **Dead-riding.** Computer in conjunction with device to give positive indication of relative motion over the ground (Doppler radar or accelerometers) is another possibility. Ground beacons in conjunction could be used to assist enroute and could set up a hybrid track. Advantages and disadvantages of such a device are essentially the same as for airborne radar, Bush said.

■ **Combination of VOR.** motionless aircraft, built because for low-level and high-speed flight, light weight plays a role, quite. A helicopter pilot flying at 45 knots or less can employ visual aids when a floating pilot flying at 150 knots can not, Bush points out.

Bush believes that an automatic pilot is "almost a necessity" for helicopters during extremely weather flight.

- **Military Role.** For Traffic-Air defense units blanket the country's areas

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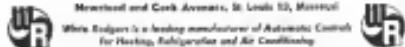
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of heavier air traffic, and could be used to improve an aerie traffic control, when it becomes possible to pipe their slope digitally to an aerie traffic control station, Dr. G. C. Corriveau told the symposium audience. However, he added that this appears to be some time off.

Corriveau, who placed a paramount role in developing GCA during the war, long ago in 1948 was, for Aerobatic Instruments Laboratory, developed new developments which hold promise of easing current radio shortcomings.

One is the use of carrier polarizations now being added to GCA's surveillance radar, to reduce the slope "distortion" caused by precipitation.

The other is the use of airborne transponder beacons, and secondary ground radar to interrogate these beacons, which will serve to identify individual aircraft on the PPI, as well as reinforce the target's position.

Corriveau suggested that further improvements in target selection and MTI (moving target indicator) performance could be obtained if the present rotation rates were reduced from 25 rpm to approximately 12 rpm. Corriveau said that the higher scan rate, a carry-over from military GCA, was selected during the war largely on the basis of expediency and availability of drive motors.

► **Results From Simulation**—A dynamic simulation located at CAE's Technical Development Evaluation Center, Indianapolis, has proven extremely valuable in developing traffic control techniques suitable for use with ground radar. See "Results of the Franklin Institute reported, Franklin Institute, under AFRL sponsorship, is responsible for developing air traffic control simulation techniques and equipment.

The simulation are also useful in evaluating new traffic data displays, and in working out optimum procedures for climbout to cruise altitude, distance, and cruise crossing.

Col. J. Francis Taylor, chairman of AFRL, agreed to pass this information and moderation.

Electro-Scan Handles Operations From Afar

Brund-Paine has developed a new digital type remote control system which can be used to transmit meteorological data from unattended weather stations, handle space interception, defend an airbase, reservation companies such as American Airlines, Pan American, or Pan American as an auxiliary.

The new system, called Electro-Scan, can transmit data and picture control information over regular telephone/telegraph lines, radio or microwave links,



UNDER ONE ROOF
By James J. Reggert, Jr.,
(Continued from page 7)



"Beneath 40 miles of catwalks enthusiastic Georgians build big jet-powered bombers and transports"

By James J. Reggert, Jr., Aviation Staff Writer, Collier's

Widest retelling a story, you can walk for 40 miles on the catwalks in GAP-6 (Government Aircraft Plant No. 6) at Marietta, Georgia. This is just another indication of the immensity of this aircraft plant, largest under one roof in the world.

Size of facility is the cornerstone of big multi-engine airplane manufacturers. One of the most important is the effect on people. The Lockheed employees at GAP-6 have never missed a production schedule. In fact, they are producing six-engine B-47 jet bombers today with 75% less

man hours than required two years ago. They have room to move around, room to do their best work,

room to use the latest forms of manufacture and assembly, room to keep an orderly system of production flowing.

Right now, Lockheed Georgians are building now

3475, modifying earlier models, and manufacturing new C-130A turboprop assault transports. And because GAP-6 is so big—76 acres of floor space under one roof in Building B-1—there is still room to build more big airplanes for the U.S. Air Force.

U.S. Air Force
Last Aircraft Plant No. 6

Lockheed
Aircraft Corporation
(Continued from page 7)

Georgia
Marietta, Marietta



Modern oil cooler of today of the latest type. Left: heat exchanger type; right: casting of heated metal sections. For maximum strength, weight and heat transfer.



Right: resistance to temperature, pressure, vibration and corrosion. For maximum strength, weight and heat transfer.

Progress In Oil Coolers . . .

Based on unique, proprietary processes for producing and heating thin metal sections, plus the largest wind tunnel laboratory facility of its kind, the Clifford Company has pioneered the major developments in this field since 1940.

As flight requirements became increasingly severe with the use of higher temperatures, greater altitude and more compact engine heat exchanger requirements, cooling of engine heat exchangers became a critical, sometimes limiting, factor in aircraft performance. The relatively simple requirements

of oil cooling by pre-war engineering techniques — that is, by using plain metal sections — became increasingly complex by the need to provide adequate heat rejection capacity within the space available — weight — and strength even above.

Three major areas Clifford began to bear an overall heat exchange problem in were the engine, the aircraft and the fuel. In the first, it has selected the major advances in the oil cooler field since 1940.

One aspect is Clifford's ability to produce and fabricate thin metal sections, based on its own development in deep drawing and stamping.

Another is its exclusive, proprietary process for heating thin metal — particularly aluminum — which is unmatched by any other producer.

At the Clifford wind tunnel laboratory — the largest, most completely equipped research facility of its kind — development in 1940 was in the manufacture of thin walled parallel bellows and thermometric assemblies.



Heat exchanger of an engine cooling system.



Production line output of aluminum heat exchangers.

Left: bellows or membranes typical of heat exchangers. Right: bellows for aluminum heat exchangers of aircraft, power and other turbines.

Today, it looks into this field by developing the new, superior hydraulic forming method for producing bellows which you can see in the standard process throughout the world.

Handling the metal sections to produce the heat exchangers, the pre-heated coolant, heat exchanger is built up Clifford's way side by side the aircraft field.

Design, drawing and extensive process eliminated the elimination of the aircraft sections in the pre-war preheaters and Clifford was asked to produce sections for the aircraft sections of aircraft oil coolers and coolant radiators.

One suspended with the field, it was found that Clifford's metal sections had a much longer life than the standard background, measured at rates of opportunity. Copper sections were not only satisfactory. The big difference was that the metal sections could be used the metal that assay failures were experienced at pressures of only 100 psi. psi. With oil pressures traditionally high — as high as 1,000 psi. — the situation was right for the introduction of a better design if one could be found.

One result of metallurgical research at Clifford had resulted in a unique proprietary process for heating thin metal sections — the "Clifford" process. It makes drawing, stamping, drawing and conversion of thin sections, Clifford independently designed and produced the first aluminum oil cooler and coolant radiator.

The new unit weighed only one-third as much as conventional engine coolers and was the first to be used in aircraft heat exchanger services. The new sections gave their enthusiastic approval and Clifford found itself in the forefront of aircraft oil cooler development.

From the use of the new aluminum of coolers and coolant radiators were the AAF F-47, P-51 and P-80. Others followed, including the B-17, B-24, B-25, B-29, B-52, B-57, B-70, B-74, B-75, B-76, B-77, B-78, B-79, B-80, B-81, B-82, B-83, B-84, B-85, B-86, B-87, B-88, B-89, B-90, B-91, B-92, B-93, B-94, B-95, B-96, B-97, B-98, B-99, B-100, B-101, B-102, B-103, B-104, B-105, B-106, B-107, B-108, B-109, B-110, B-111, B-112, B-113, B-114, B-115, B-116, B-117, B-118, B-119, B-120, B-121, B-122, B-123, B-124, B-125, B-126, B-127, B-128, B-129, B-130, B-131, B-132, B-133, B-134, B-135, B-136, B-137, B-138, B-139, B-140, B-141, B-142, B-143, B-144, B-145, B-146, B-147, B-148, B-149, B-150, B-151, B-152, B-153, B-154, B-155, B-156, B-157, B-158, B-159, B-160, B-161, B-162, B-163, B-164, B-165, B-166, B-167, B-168, B-169, B-170, B-171, B-172, B-173, B-174, B-175, B-176, B-177, B-178, B-179, B-180, B-181, B-182, B-183, B-184, B-185, B-186, B-187, B-188, B-189, B-190, B-191, B-192, B-193, B-194, B-195, B-196, B-197, B-198, B-199, B-200, B-201, B-202, B-203, B-204, B-205, B-206, B-207, B-208, B-209, 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If - and when - the emergency arises: Western Europe, operating forces will probably be a swift attack at night in doubtful weather. The payload of some 20 hydrogen bombs can be delivered with the minimum of air power. No more one thousand hours' route. It will be a rapid attack, fully loaded, ready to fight in any weather, for or foul, in a matter of minutes - and it can be refuelled and re-armed in minutes. No other all-weather fighter needs anywhere two such range, speed, the power in radar. No wonder then that senior air force leaders in Europe say the Javelin is the most important aircraft in Europe. It is now in super priority production for the Royal Air Force, by Gloster, makers of the world's fast, accurate jet aircraft, and members of the remarkable Boulton-Paul-Gloster Group.

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► **Analogs.** Uni-Bend Pacific is currently installing an Electro-Span system for transmitting meteorological data from a number of remote weather stations for an automated computer, probably a relay. The new system appears to be well suited for flying in with large magnetic memory drums such as the one CAA is now evaluating as a means of storing meteorological and aircraft flight plan information as digital form.

Electro-Span also could be used to turn on and off a variety of field lights and landing lights at a remote auxiliary landing field, employing only a single pair of telephone wires, or a radio link.

Electro-Span also can be used to transmit information contained on punch cards to a remote location for operating punch-card machines. The new system was originally developed for a classified nuclear project.

► **Two Types.** The new digital control system is available in two basic types, each of which can be tailored to a specific job.

► Frequency-coded, transmitting data by means of a group of simultaneous tones selected according to the binary code being transmitted. The system can handle 100 "bits" per second, requires a 2,600-cps bandwidth.

► Pulse-coded, transmitted sequentially, at a rate of 100 bits/sec., and requires a bandwidth of only 30 cps.

Through the use of multiple pulse trains, the company says that virtually any number of kilometers and modulations may be accommodated.

► **Accuracy.** System accuracy (or noise figure, resolution) depends upon the length of the binary number system used. A 10-digit number system provides resolution to within 1.5%, a 10-digit system to within 0.1%. A minimum 16-bit binary code is used which limits coding errors to plus or minus one number position.

Additional information may be obtained from Dept. 8H, Pacific Division, Uni-Bend Pacific Corporation, 1600 Sherman Way, North Hollywood, Calif.

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BALTIMORE

Interesting highlights from some of the papers presented here during the recent East Coast Conference on Antennas and Naugahyde Electronics include:

► Sharp-Eyed: Two Radar-Bitter canisters of ground targets are expected from a new target surface detection equipment (ASDE) under development by Aerobee Instruments Lab in a series of larger antennas which will cover various beamwidths. New ASDE beamwidths will be 0.15 deg vs 8.1 deg. for the earlier and demonstrated at N. Y. International Airport (AVIATION WEEK Sept. 29, 1951, p. 35).

New radars, being developed under ANSDR sponsorship, will have a 12x48 antenna enclosed in a shielded air抬ated enclosure to minimize wind load effects. F. E. Woodward of AIL reported. AIL is also exploring ways of meeting the transponder dilemma using a radio link. Woodward said.

► ABC-31: Looking Better—RCA's much anticipated ABC-31 high-frequency transceiver, whose early unreliability precipitated a congressional investigation (AVIATION WEEK Aug. 9, p. 78) has had a "forty-fold" increase in its reliability in the past six months. George H. Schenck, head of the communications branch, WADC, told the Baltimore symposium conference here. One reason for the improvement, according to Schenck, is improved quality control measures, including a 10-hour vibration test with vibration during 10 seconds of each hour. Some observers predict that Fokker Flying Gunboats in port on directional ABC-31 tests will be extremely favorable.

► Stable Tilted: Tilted-tilting gyro as a spatial reference for stabilized platforms are superior to rate gyro employing an external tilting mechanism, giving an order of magnitude greater resolution, H. K. Whitman of the Massachusetts Institute of Tech says, he reported.

► New UHF Direction Finder: A much improved, more refined, direction finding antenna developed by Aerobee Instruments Lab is credited with making possible a successful airborne UHF direction finder, the AN/ARRA-5, by solving the problem of multiple reflections from the airplane in this frequency band, according to Peter D. Stroh of AIL. Developed for



FURY ON THE TRAIL

Pursuitfully, as it is a rendezvous with doom—as indeed it is—the guided missile blots its way through the long plumes of the sky. The roaring flame is its power, but the "eyes" and "brain" that guide and control it are electronics.

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Navy. Today, the ARA-25 is being produced by Cessna Radio and by sister companies with the ABC 12 UH-19 transport. Stress reported that ARA-25 landing gear collapses when plane is landed toward station, but may run as high as 20 degrees when the station direction is favorable.

► Report on Nevada "DMR" — A status report on the development of a very high accuracy loxocet standard, as used for the diameter measuring portion of the new Nevada long-distance road, was presented to the Battlement roadway audience by C. R. Hewitt, Wright Air Development Center. A test was developed in Bell Lab winging 50 lbs., averaging 2 in. H. and which can measure its response to within one part in one billion for 24 hours, at a steady test by National Bureau of Standards' Boulder, Colorado, test lab. Developments are under way on a 100-cm. test and weight to 4 in. H. and 15 lbs., and increasing accuracy attainable to 3 hours, which approach a man's typical flight time, Hawaii reported. —PK

New Equipment For Servo Systems

A new servo-amplifier for operation two-plane, 900-watt servo section, weighs only 55 lbs. It is one of six completely redesigned designs introduced for use in servo mechanisms.

The new type VA-4A-50 amplifier uses solenoid tubes. It delivers 4 watts into the control plate of an a.c. motor, when driven by a 200-watt signal. The unit is encapsulated in epoxy resin and designed for continuous operation at 85°C. Dimensions are 4 x 24 x 14 in. Manufactured Clinton Precision Products Co., Maple St. Research, Clinton Heights, Pa.

Clinton also offers components and/or

• Servoamplifiers 6 in. wide with plane, two-plane solenoid, increasing only 2 in. in diameter and weighing as low as 5 lbs., is available in 19 different standard gear reduction ratios. Motor length varies between 21 and 34 in., depending on ratio. Motor is a permanent magnet type. Manufacturer: Gilead Industries, Inc., 1788 Shuster Ave., Downey.

• Modulator-amplifier, with 100-watt input and 100-watt output, will accept a.c., d.c. and pulse input current signals as low as 20 microamperes and power gains of 300 to 1,000. Unit weighs 4 lbs., occupies 12 in. or less, has built-in temperature compensation, frequency response of 100-800 cps., and operating temperature range of -92°F to 180°F. Manufacturer: Standard Plastics and Electronics Co., 11640 S. Robertson Blvd., Los Angeles 51, Calif.

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BIGGER RADOMES FOR MORE PROTECTION The radar Super Constellation jet plane is an extremely vital unit for U.S. protection. It can now be an intense radar of enemy aircraft, because it has long range, high speed, plus its electronic intelligence packed in instruments as big as cruise missile pods like the license one pictured above.

WORLD'S FASTEST PROPELLER-DRIVEN AIRPLANE is to become Super Constellation for the U.S. Navy (bottom below). Now flying, it will be capable of speeds up to 300 miles per hour than any propeller airplane now in service. Powered by Pratt & Whitney T-33 turbo-propeller engines, this plane has speed, new performance and greater economy potential.



NEWEST TRANSPORT CONCEPT is Lockheed's C-124, a long-range, multi-turboprop, driven here in its distinctive four flight. Now in production to Government Airplane Plan (See 8), operated by Lockheed's Georgia Division in

Atlanta, this giant plane already jumped off the runway at one-third the distance required for today's commercial transports. This new cargo plane accommodates a crew of four, handles 80 tons of cargo, fuel, equipment and supplies.

6 New Lockheeds for U.S. Protection

Powerful Team: Includes Truly Amazing Jet Fighter, High-Speed Aerial Transport and Vital Picket Plane

1954 has been a notable year for Lockheed, in research, development and production. For new aircraft in one year include: world's first transonic propeller-driven transport, world's first subsonic multi-turboprop, latest version of the Navy's Super Constellation, new plane that can fly twice as far as any plane for the same weight, and a truly amazing jet fighter, the F-104 never produced, which is one secret no photograph can describe.

On these pages are shown six new models except the proposed F-104. Also photographed is the vital Super Constellation jet plane, with distinctive top hump, which can fly 8,000 miles at 300 miles per hour. It can carry 10,000 and 60,000 pounds of freight, passengers, or mail to a destination in place only 20 hours removed, due to ingenious Lockheed design.

FLIES STRAIGHT AND LANDS STRAIGHT DOWN (above) Lockheed XP-80A Voodoo, a revolutionary new aircraft of superbly developed as compared with the U.S. Navy plane, every step ahead. It can fly straight down at 400 miles per hour. Each model becomes a leading field of interest.



NEW NAVY ADVANCED JET TRAINER Often called the world's safest jet airplane, Lockheed's new T-33 is advanced trainer for the U.S. Navy for a many new safety and performance features it can be used for carrier landing and takeoff and can make runway short fields for pinpoint accuracy. By training future jet pilots quickly, this trainer boosts Navy's ability to protect Americas. Another product of this Navy-developed design teamwork.

ADVANCED GUIDED MISSILE SYSTEMS DEVELOPMENT

Electronics, nuclear physics, and other sciences have joined Lockheed's new Missile Systems Division in Van Nuys, California. Their mission is to take the best of these sciences and to give war and peace friendly relatives means of delivering our defenses and technology weapons to their targets. It is an important part of the company's proposed \$100-million program of advocacy research and development.

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EQUIPMENT



AIRLINE EXPERIENCE with hydraulic systems, plus a set of definite ground rules guided Boeing engineers in design of 707's equipment.

Boeing Reveals 707's Hydraulic Details

DETROIT—Boeing Airplane Co. recently gave the aerospace industry its first detailed look at the design, operation and features of the hydraulic system of its swept-wing long-haul transport, the 707.

The look came during the 1954 Transport Aircraft Hydraulic Conference, sponsored by Velox, Inc., last October. It was presented by Boeing engineers Ed Platous and Al Hansen, who were a part of a team on the 707's hydraulic system. Hansen developed the paper and added some notes at the end of his comments.

► No Magic—There is no magic associated with the design of a hydraulic system for bypassed jet transports, says more than there is for conventional aircraft, the authors state. As with any system for any plane, the hydraulic system is a series of compromises.

These are the ground rules Boeing engineers laid down for themselves to follow:

- Make it simple.
- Design as smoothly and compactly as possible.
- Design so smoothly and compactly that components will appear.
- Watch the details—they can make or break the system.
- Plan the controls so that passengers won't feel any affect of the aircraft.
- Make it accessible for maintenance.
- Mechanics don't generally have college degrees.
- Safety first.

In Boeing's engineering department these rules were coupled with the results of engineering survey teams who had toured typical maintenance bases to find

out from the airlines "what not to do." "In some respects you can say that the hydraulic system of the 707 was designed in reverse," Platous said.

"In addition to the findings of these engineering teams, Boeing made careful studies of HALD (Handbook of Instructions for Aircraft Designers), CAR (Civil Air Regulations) and MIL (Military) Air Requirements to analyze the remaining behind these regulations, standards and call from them all possible helpful material. So the final design of the 707's hydraulic system is based on a broad foundation of facts reflecting the brief and most up-to-date thinking in aircraft hydraulic system design."

► New Concepts—A fundamental change in system operation concept is apparent in the 707 when compared to its conventional piston engine predecessor, the 377 Stratoliner. On the Stratoliner, the main gear, tail gear, nose gear, wing flaps, wing flap and landing gear operations were electrically powered. The 377's hydraulic system supplied power only for pitch functions as windshields open, nose gear steering, brakes and landing boost. By contrast, on the 707 all of the following services are hydraulically operated: bulk system, landing gear operations, nose gear steering, wing flap and wing spoiler operation.

► Dual Systems—The completely independent tail section hydraulic system, labeled "left" and "right" (because of these respective positions on the aircraft) has been designed to fit the 707 for safety considerations. Each has its independent power and distribution systems

for emergency operation, a cross-over valve is installed to allow either the left or right system to supply power for wing flap and landing gear operation.

Additional sources of emergency power are electrically driven hydraulic pumps, one for each system. The pumps, each of which has its independent motor, are located under the floor in the plane's center line. These provide backup labeled "emergency," "secondary flight," and "automatic."

First position is a secondary position and will supply pressure to a separate selector valve to either raise or lower the gear. The automatic position allows the pump to be used for ground check-out before engine starting, or for emergency power in flight.

► Fire Protection—Here is a list of precautions taken by Boeing engineers to reduce the hazard of a hydraulic fire in a closed system:

- No hydraulics lines have been installed in the pressurized cabin and no lines have been buried where they cannot be expected.
- Major portion of the hydraulic system is exposed along the wing root spar and in the wheel wells.
- Fire valves are installed in pump suction lines.
- Hydraulic reservoirs are installed in the wing tips.

► Pressure Valves—Valves have been installed to prevent leakage, overpressure and to prevent damage to all electrical connections have been sealed.

► Power System—Platous lists three as

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front of "rig drilled" locations whenever possible.

- All valves should be controlled in every position through positive, mechanical linkage. Spring return to normal valve should not be tolerated.
- Diverter valves should be designed so that safety of the aircraft will not be affected if a system is out of fluid.
- Monostable valves should be used throughout the system to avoid stages.
- All cabin-controlled valves should be allowed sufficient deflection to make rigging easy.
- All cabin-controlled valves should be designed to withstand severe bending without leakage.
- Hydraulically cylinders should not have piston stops. Accuracy of end positions must be provided through deflection indicators.
- Sealage of fastening devices (such as wing gaskets) should be provided to prevent fatigue failure.
- Independence of hydraulics systems from other systems must be assured to obtain maximum reliability.

► **Spoiler System**—The 707 is equipped with a differential wing spoiler system to increase lateral control. (The 707's rate-of-roll equals that of the 720 Super jet, according to Pitotot. The pass spoiler can be operated symmetrically or in bores to control angle of attack, the aircraft's descent or for ground control.

Spoiler system makeup is each wing, four actuating cylinders, a matching valve, bellows check valve, follow-up linkage and an electrically operated shutoff valve.

For lateral control, spoiler valve is operated by aileron control cables. For symmetrical air brake control, a lever next to the flap actuators operates the same gear valve through a control cable linkage. Spoiler control lever is placed next to the aileron control lever so as to permit the pilot to take off in case of an aircraft mishap when the spoilers would be used to lift wing. When putting full weight of the plane in its wheels to allow maximum braking effectiveness, Spoiler operates very quickly—1.2 sec. to open, 0.8 sec. to close.

Following is obtained from only one set of spoilers. Remaining spoilers are near their position according to the load. Check valve allows spoilers to blow down automatically if design speed is exceeded.

► **Flap System**—The wing flap system is a three-position design and is made up of two completely independent 17° double surface flaps to assist aircraft in landing. The outboard flaps are actuated by torque tubes driving bell bearing axles of the flaps and are driven by a hydraulic motor. Inboard flaps operate the same way.

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PROBLEM	ARMENI	DESCRIPTION
1. Abrasive cleaning	Abrax®	All-purpose, non-staining, non-abrasive cleaning fluid and solvent.
2. Dissolving aluminum prior to spot welding	WPA®	From temporary adhesive cleaner to instant solvent of aluminum alloys.
3. Aluminum cleaning	WA-6®	Heavy-duty cleaner for the aerospace, naval, space and defense industries.
4. Removing heat-treat scale from aluminum and stainless steel heat-treating bars	NF-400	Replace dangerous hydrofluoric acid with a safer to handle and easy-to-use alternative.
5. Painted metal scaling	Heated	Friction scaling. Cut before paint, don't heat! Scale, scaling, break or spray on.
6. Waterless paint-booth compressor	None	There aren't compressors required to fill the paint booth unless there's already leakage.
7. Recirculating	PA-1®	Heavy-duty deodorizer for cleaning paint before recycling. Environmentally safe.
8. Aircraft cleaning	None	Add to water in tank cleaning for brighter aircraft surfaces. Non-toxic, light formula.
9. Rust solvents (anti-sip)	Reckon®	an all-purpose rust cleaner, rust preventative and rust inhibitor for treated and cast iron.

MODIFICATION AND MAINTENANCE

10. Brake cleaning	ABRA	Corrosion inhibitor, removes all types of oil and grease residues, water and dirt.
11. Cylinder cleaning	1-358H	ABRA (100% Specification MIL-H-8753E and MIL-DT-7223, MIL-PRF-908 and water soluble).
12. Corrosion cleaning	P-1075	Non-corrosive, non-explosive organic surface cleaner for gas- and piston-engine parts.
13. Integral fuel tank cleaning	ABPA	A 100% solvent for removing all types of fuel tank residues. Nonflammable.
14. Removing exhaust valves	F-20	Removes exhaust valves, piston, piston rings and exhaust valves. Nonflammable.
15. Welding aircraft aluminum	ABPAW® L255H	An excellent surface cleaner for regular aircraft maintenance.
16. Paint remedying	Sparsen®	Abundant surface cleaner for aircraft maintenance.
17. Engine heat cell cleaning	WPA®	An all-purpose cleaner for removing dirt, oil and grease from engine surfaces.
18. Welding residue cleaning	SPF	A special line cleaner for removing aluminum cleaner (MIL-H-5541).
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following linkage, control the motion. The valves are cable-operated from a single position lever located in the cockpit.

Although mechanical doors have been provided, both on the wings and on the flap track, they are not intended for normal use since the following mechanism provides tampered hydraulic stops at all positions.

► **McDonnell Douglas.** A sequencing lever in the cockpit controls the main landing gear through a valve located in the main gear well. Linkage between lever and valve is cable. Ground control has been allowed to avoid necessity for servo racking.

Large gear and doors are operated by separate cylinders with positive mechanism sequencing as all positive doors are closed when every landing gear extension or retraction.

Another set of automatic sequencing controls apply when both as soon as gear starts retraction into release before after landing gear is locked in the up position. This stops wheels quickly after takeoff to ensure that the logic main gear will be properly positioned for storage in the gear wells. Rollers are then allowed to keep unnecessary hydraulic pressure from the landing gear during storage.

Since the landing gear is used as an air brake during takeoffs from high altitude, using engineers and extreme care in designing for high temperature ratings which such operations would normally encounter.

The main gear doors lock at both ends of the cylinder. There are three limit switch go to the cylinder up, low, down and balance limit, whose purpose is to ensure that any stops in the return limit lead to lock, not unlock the gear.

A mechanical cylinder and down lock mechanism is included as one of the safety devices to combat failure.

Other points about the landing gear:

Retraction while the airplane is on the ground is virtually impossible. The main gear will not retract while aircraft weight is on it, even if the landing gear control handle is placed in the up position. Because retraction is achieved (but released) via pressure exerted by the hydraulic system is insufficient to slide the tires on the ramp. The nose gear has an integral built-downlock upon which the cockpit.

Another advantage of the cockpit-locked nose gear is that it is impossible, with the 707, to have non-retractable landing gear when airborne. The nose gear can be unlocked while in flight and the main gear do not have any float locks.

Also, wing flap and landing gear handles are widely separated in the cockpit to make inadvertent contact of the two controls impossible.

► **Boeing.** Systems valves are operated independently from the pilot's and re-



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FAA TECHNICIANS install new GE CH-10 turbochargers on Stratocruiser

new turbo on its nonstop New York-Panama-New York-London flight scheduled to begin Dec. 15 (Aviation Week Sept. 26, p. 26). The installation is expected to increase the planes' range by 60-100 mi. under normal operating conditions.

Replacement of the Stratocruiser's present turbine with the new model is part of a \$1.3-million three-phase modification program by the airline in cooperation with Boeing Airplane Co. and General Electric. It also provides an increased fuel capacity. The new GE Stratocruiser will now be able to burn 416 gal., bringing total range to 8,200 mi., and extending range by 300 mi.

The new CH-10 turbochargers, produced by GE's Aircraft Engines Division, Tashua Park, Lynn, Mass., turn the turbine end of a reduction gearbox such as that in the Boeing B-52 piston-engine bomber and the compressor end of the standard Stratocruiser turbine. With its large diameter and reduced gears pass through with low resistance, allowing greater power to the engine cylinder heads and lowering temperatures.

Cooler engine temperatures permits cold legs to be closed as exists now, decreasing drag enough to give the 60-100 mi. range increase. A revised engine operating technique involves a higher cruise altitude and lower propeller speed, which should increase the plane's speed.

The CH-10 turbo weighs 239 lb. Up to 25,000 ft., it delivers an airflow of 239 lb. sec. with a discharge pressure of 27.5 in. of mercury absolute.

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Capital Airlines' Veneer. will be equipped with Eclipse-Pioneer TE-10A automatic pitch and flight path computers, says Braxx International.

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In Aug., Aerodynamics Division head, discusses results of high-speed wind tunnel research on drag of rough and delta wing planforms with Richard Hedges, Aerodynamics Department head (standing), and Aerodynamics Research Research (seated right).

Lockheed Expands Aerodynamics Staff

With five prototypes already in or near flight test, Lockheed's Aerodynamics Division is expanding its staff to handle greatly increased research and development on future aircraft, on commercial and military fields.

The five prototypes, which show the breadth and versatility of Lockheed engineering, are: The XF-104 supersonic air superiority fighter; the XF-106 vertical flying fighter; C-135 U.S.A.F. turbo-prop cargo transport; RTV-3 U.S.A.F. turbo-prop Super Constellation transport; and an advanced jet trainer of the T-33 type.

New projects now in module are even more diversified and offer career-minded Aerodynamics Engineers and Aerodynamics unusual opportunity to create supersonic inlet designs for flight at extremely high altitude, switch burner jets with rapid oscillation of supersonic aircraft at low altitude, develop boundary layer control systems for safe take-off and landing of aircraft and transports, remove silicon reverse and hot water problems incurred in high-speed flight through analysis and design, participate in determining configurations of turbo-prop and jet transports and advanced fighters, interceptors and bombers.

To Aerodynamics was interested in these problems Lockheed offers: increased salary rates over all others, generous travel and moving allowances, opportunity to enjoy Southern California life and an unusually wide range of employee benefits which add approximately 14% to each engineer's salary in the form of insurance, retirement pension, sick leave, profit, etc.

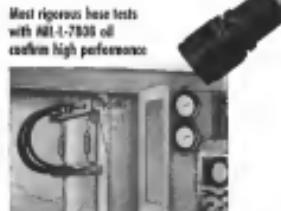
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Airlines to Show Solid Gains for 1954

- ATA expects revenues to top last year by 9.8%.

- Five percent slip seen in profit margins of 1953.

By Frank Shee, Jr.

Preliminary 1954 estimates indicate the air transport industry again added substantially to the dynamic power it has enjoyed in the past.

While gains are not as marked in last year, they are impressive. Complete information exists only for the first three quarters, but Air Transport Area estimates the year-end total will show domestic freight revenues up about 9.8% over the 1953 record.

Total revenue ton-miles will show a 15.6% rise over last year's 2.25 billion, while the increase in revenue passenger miles will range somewhere between 14.5 and 15.5, according to ATA.

► **Profit Margin.**—For the permanent active members, profit margins are estimated to narrow despite gains in all other revenue areas. On Sept. 30, the aggregate air operating income for the country's 13 leading domestic carriers stood at \$75.7 million, a lag of 5.3% from last year's \$80 million for the same period.

Indications are that there will be very little variance in the percentage when all 16-quarter figures are tabulated. In fact, airlines will be happy to maintain this modest spread in light of usual last-quarter traffic slumps.

There are many reasons for the narrowing profit margin. Wage and material costs remain high, new plane acquisition expenses are being incurred by many carriers, and depreciation charges generally are rising. However, most companies agree that the biggest reason is the long-sluggish fare level.

► **CATA Stand.**—Catastrophe Board has shown an sympathetic ear to the letter repeatedly demonstrating its opposition to any change in fare levels in this field. As a result, airlines officials have reluctantly hope that the entire nation of carriers' profit margin will be nixed in the near future.

One company official says, "Let's face reality. Raise fares certainly are not sensible going to waste around and up the other way. The only sensible, and also the only practical, method is in a revision of the fare structure. Hold something given, the downward spiral is bound to continue so far as profit margins concerned."

Domestic Airline Boxscore to Sept. 30

	Total Revenue Receipts (in millions)		Net Revenue Income (in millions)
	1953	1954	
Airways ¹	\$11,000	\$11,600	\$1,600
Airail ²	21,000	25,200	4,200
Capital ³	10,200	10,400	200
Continental ⁴	10,000	10,000	200
Delta-CWA ⁵	10,000	10,000	200
Eastern ⁶	27,000	30,000	3,000
Northwest ⁷	10,000	10,400	400
Trans World ⁸	10,000	10,000	200
United ⁹	10,000	10,000	200
Western ¹⁰	11,000	11,000	200
Total	\$173,300	\$194,900	\$16,700
Average Profit Margin (in millions)		\$9.45	\$8.94
Revenue Percentage Margin			
Airways ¹	21.0%	21.7%	21.0%
Airail ²	15.0%	16.0%	16.0%
Capital ³	10.0%	10.0%	10.0%
Continental ⁴	10.0%	10.0%	10.0%
Delta-CWA ⁵	10.0%	10.0%	10.0%
Eastern ⁶	10.0%	10.0%	10.0%
Northwest ⁷	10.0%	10.0%	10.0%
Trans World ⁸	10.0%	10.0%	10.0%
United ⁹	10.0%	10.0%	10.0%
Western ¹⁰	10.0%	10.0%	10.0%
Total	10.0%	10.0%	10.0%

*Airline Survey by ATA.

Couch traffic also has been a profit factor for the industry this year. While passenger traffic continues its year-to-year, the sharp growth in couch traffic is steadily dampening prospective gains in passenger revenues.

► **Couch Gains.**—Most of the traffic gain

Load Factors

Load factors of U.S. domestic air lines for the first three-quarters of 1954 as compared to the same period last year:

1953	1954
Airways ¹	57.2
Resell ²	56.5
Capital ³	59.8
Continental ⁴	59.7
Delta-CWA ⁵	48.7
Eastern ⁶	57.9
Northwest ⁷	50.2
Trans World ⁸	56.2
United ⁹	56.3
Western ¹⁰	59.4
Total	56.6
Northwest ⁷	59.5
Northwest ⁷	58.4
Northwest ⁷	57.2
Northwest ⁷	56.9
TWA ¹¹	60.7
United ⁹	57.2
Western ¹⁰	58.1
Total	56.4
*1953-1954	
†1953-1954	

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advantages. This, coupled with spreading discount and pay-later plans, improved dependability and reliability, and expansion of fleets, points to even heavier penetration of the national jet market market.

Other economic potentials of major consideration include the growing popularity now shift to the east coast to the West and Southwest; the general broad-based deconcentration in industry and the steadily rising standard of living.

Taken together, they indicate a bright outlook from the standpoint of growth. General industry feeling seems to be that, if the fuel cost problem can somehow be mitigated, there will be no hindrance to the growth in all categories.

NEA's Turner Heads Air Traffic Conference

Robert L. Turner, vice president-sales of Northeast Airlines, has been elected president of the Air Traffic Conference of America. He succeeds Charles R. Spurr, American Airlines' assistant vice president.

Arthur F. Kelly, vice president-treasurer for Western Air Lines, and R. H. Beck, Board of Governors, American Airlines, were elected first and second vice presidents respectively.

■ **Resumed Seats**—Among major items discussed were an American Airlines' plan for a priority system for air-show passengers and a maximum charge proposal by National Airlines.

NA's proposal envision selling each passenger one ticket for travel on the lines of the carrier or names involved and a separate ticket for reserved space on the carrier.

■ **Charge Forfeit**—In the event of cancellation of an air show by the organizer, the airline would absorb the travel charge, but the passenger would forfeit the reservation charge.

NA hopes for industrywide adoption of the plan, holding that one airline could not maintain it effectively.

Board Approves New Swissair Service

Swissair has obtained new service points in Civil Aeronautics Board authorization of the Swissair's foreign air carrier permit.

The newsworthy authorizations cover to "a port or ports" in Switzerland, rather than having transited points to Geneva and Zurich, and with Manchester, England, as an intermediate point.

The increased authority now permits Swissair to offer service between Swiss points, Frankfurt am Main, Manchester, Shannon, The Azores, Gander and New York.



R. B. STEWART



JOSEPH J. O'CONNELL

Employees May Buy Lake Central

By Katherine Johnson

The first employee-owned airline or the history of the industry as far as post war airline will be introduced if Civil Aeronautics Board approves a proposed plan for reorganization of Lake Central Airlines.

Outlook for approval appears highly favorable.

The plan, to be submitted to CAB now, also contemplates active local participation by business, financial, publishing and other interests in the natural light being that local areas that operate in the Indiana-Chicago area.

■ **\$300,000 Down Payment**—Highlights of the reorganization proposal to be made to CAB:

■ LCA employees would purchase the total company stock of \$2,974 shares at \$1 a share. They would buy 25% of the stock, or approximately \$300,000 worth, outright.

The remaining 75% of the purchase would be financed by a loan from an Indianapolis bank, with employees agreeing to repay the loan, either by salary deduction or direct payment, over a period of 10 years.

The employee purchase price represents nearly as much as invested.

■ Lake Central stock would be re-named during the interim period by a new voting trustee. He is Joseph J. O'Connell, Civil Aeronautics Board chairman (1948-49). Before the CAB appointment, O'Connell was general counsel of the Treasury Department. He now is a member of the Washington law firm of Chapman, Bryan, Walsh & O'Connell.

■ Board of directors will be enlarged to as many as 12 members to make it broadly representative of local interests

and will include at least one employee representative. The present ownership plan is to be used. The expansion is to be with the present total of CAB members to be larger and more representative for local travel markets.

CAB member Joseph Adam says there should be "as much or less than" types of local campaigns for the leader lists.

One selector for the new Lake Central board: Gene Duffield, assistant to the publisher of the *Cincinnati Enquirer*, serving one of the main traffic areas of Lake Central's system. Duffield formerly was chief of the Washington bureau of the Wall Street Journal and later served as special assistant to the late James Forrestal, former Secretary of the Navy and the first Defense Secretary.

■ **Refinancing**—Program would give Lake Central \$100,000 working capital to improve its position and credit rating. The airline now is three to face another hard or paying birth.

An Indianapolis bank would assume \$200,000 of LCA's indebtedness and advance the company a \$100,000 loan, with an even DC-3 transport as security.

■ **North Central Bid**—Our handle to an announcement of the new Lake Central reorganization plan is the possibility that CAB will approve a pending proposal and order acquisition of LCA by North Central Airlines. This possibility is considered remote.

North Central serves the Michigan-Wisconsin-Wisconsin and adjacent to Lake Central's territory.

Employees may stock under the employee ownership plan, however, would not be on a stock scale to North Central—should the reorganization be ordered by CAB. NCA's purchase



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News Sidelights

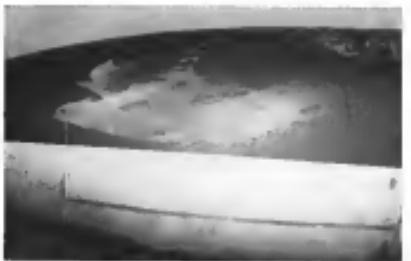
Steve Wattam's "Buster," classic midjet star, has been placed on permanent exhibit at the Smithsonian Institution's National Air and Space

Reduction in cost of full aviation coverage on life insurance policies for commercial and private pilots, decreasing extra premium up to 20% in certain classes, is being granted by Aetna Life Insurance Co., 39, Long.

Stoppage of baby carriage production in Ravine glass factories has been mentioned already in the former messages. In this

Business volume of \$10 million annually currently is being handled by Haven Aircraft Corp., Birmingham, Ala., operating as a subagent under Air Materiel Command. The firm handles modifications and repairs on 835 and C-119s and is looking into possibilities of jet maintenance, which would have to mean enlarging the plant.

Nearly 5,000 ft. of flight time were logged by 16 Bell 47 helicopters in about 110 days on a fast snow mobile traverse conducted for the U. S. government in Alaska by Keith Helgeson and his indigenous, Alaska Helicopters. Copilot carried more than 1,000 persons and 700,000 lb. of equipment over rough terrain and maintained a better than 95% on schedule record.



TERRIFIC IMPACT of a propane bottle a Concorde T51 Silver Star jet plane's wingtip fuel tank while the plane was flying left has dented a portion of the left wing, the company tells us. The missing section was discovered after mechanics cleared off the remains of 10 birds caught in the T51.

AVIATION CALENDAR

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AVIATION WEEK-DECEMBER 6, 1974

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EDITORIAL

A Significant Experiment

Cost Aeronautics Board will be disbanded shortly to approve financing and reorganization of Lake Central Airlines, a Midwest local service carrier, to prevent sale of stock to employees and the public as the company's service ends.

This striking new idea, outlined in a story on page 166 of this issue of *Aerospace* Week, seems to have made to meet the well-publicized demands of certain members of the Board itself the past year or so. These government officials have wanted the local service or "feeder" airlines that they may not fully the solid support of their constituents on a "use the service or lose it" basis. Otherwise, in some areas, there is little hope that the small less can build up traffic and subsidy requirements and attain a sound economic basis.

It is encouraging that the plan is being proposed by Joseph O'Connell, with experience as a former chairman of CAB, and earlier in general counsel of the U. S. Treasury Department. Mr. O'Connell, as an astute voting trustee, would control the stock until permanent management is established.

We hope the plan is forced ahead far enough to win approval by the Board and that it gets a fair trial as the first project to assure an employee-owned airline in the United States.

It is difficult to conceive a plan more likely to assure maximum possible support from employer and constituents than this one. Its approval will launch a significant experiment in commercial air transportation.

The Public Will Win

Never have we seen anything to equal the white heat competition among new aircraft manufacturers of commercial transport planes.

The battle for airline contracts—and possible subsidy transport orders for the best products—now on both sides of the Atlantic-American vs. British, and American vs. American.

There is not a moment to lose. Despite the past year's early lead, the British setback did damage to its once bright commercial future. Along comes Boeing with its jet 707 road-haul. This advance shows either U. S. manufacturers' place for all jet transports, although there are several on the boards.

The scene suddenly turns to turboprops, and British Victoria seizes the aviation world by selling Capital Airlines a big fleet—to start operating as soon as this coming spring.

Douglas tops its piston-engine DC-7, already the fastest American transport, with another surprise—the longer-range jet DC-8, and clinches more orders. Lack here clearly on its Sept. Constitution to the maximum, agrees with a military telegram that shows concentration interest, and now creates a newer, faster, longer-range, three-winged turboprop congressional edition that it creates hope well outside the DC-7C or anything else, except entries in the jetplane category. Lockheed also has the will to halve the price, and foist all those flight contraband a while longer.

—Robert H. Wood

Meanwhile, there are other plans under consideration that would utilize various British or American turboprop power installations in meeting American interests with a minimum of construction changes.

It's a fast moving race, with the leaders changing places continually. Those who are letting on an outcome at this early stage are not individuals, indeed, and they probably are unprepared observers of aviation, because obviously, here, there is really no outcome in this racing between low cost, constant change and expense—on a race that never ends.

The public and national security are the real winners in all this. That is the way it should be.

The Von Karman Award

The announcement decision of a distinguished committee to award the 1954 Wright Brothers Memorial Trophy to Dr. Theodore Von Karman is a fitting choice.

The trophy is bestowed each year for "significant public service as a catalyst of enduring value to aviation in the United States."

The von Karman citation accompanying the trophy, to be presented in Washington at a dinner on Dec. 17, declares that "no other man has had a greater influence on the development of high-speed aircraft in the United States."

Basic contributions Dr. Von Karman has made to the development of supersonic research and operational aircraft include these:

- First theory of supersonic drag in 1935.
- First supersonic windtunnel project in the U. S. in 1936.
- Conception and development of Jato to the point of practical application.
- Initiation of the first Air Force jet propulsion and rocket motor development project at the California Institute of Technology in 1938.
- Presentation of the first comprehensive theory of supersonic aerodynamics, considered the "bible" of its field.

Dr. Von Karman is now in Europe as chairman of the Advisory Group for Aeronautical Research and Development under NATO and also a chairman of the Air Force Scientific Advisory Board. A native of Hungary, he was educated at the Royal Technological University of Budapest and received a doctor's degree in engineering from the University of Göttingen.

Members of the committee which unanimously selected Dr. Von Karman were:

Thomas G. Langford, vice president of Convair and president of National Aerospace Assn.; S. Paul Johnson, director of the Institute of the Aeronautical Sciences; Adm. Donald C. Barnes, president of Aeronaut Industries Assn.; Brig. Gen. Milton A. Knobell, vice president of Air Transport Assn.; Joseph O'Connell, former chairman of the Civil Aeronautics Board; Dr. Hugh Dryden, director of the National Advisory Committee for Aeronautics; Ralph Fabit, immediate past president of the Aviation Writers Assn.



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Increase Non-Stop Service Range**

Wingtip fuel tanks, like those on the test plane above, are now available on all Lockheed 1049G planes to extend the normal flying range for passenger airliners up to 4620 miles. The two teardrop-shaped tanks, holding 600 gallons of fuel each, provide up to 850 miles more range for increased nonstop service across the Atlantic and on other long-distance air routes.

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